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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 7, NUMBER 9
MAY 1, 1974

W74-04301 -- W74-04850

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

SELECTED WATER RESOURCES ABSTRACTS is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior, Washington, D. C. 20240.

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 7, NUMBER 9
MAY 1, 1974

W74-04301 -- W74-04850

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

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07 RESOURCES DATA
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
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10 SCIENTIFIC AND TECHNICAL INFORMATION
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ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

VISCOSITY MEASUREMENTS OF WATER IN REGION OF ITS MAXIMUM DENSITY,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2K.
W74-04518

2. WATER CYCLE

2A. General

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME I, PRINCIPLES OF COMPUTATION,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W74-04301

HYDROLOGY OF THE CENTRAL ARCTIC RIVER BASINS OF ALASKA,
Alaska Univ., College. Inst. of Water Resources.
D. L. Kane, and R. F. Carlson.
Available from National Technical Information Service as PB-228 011 $3.75 in paper copy, $1.45 in microfiche. Report No. IWR-41, December, 1973. 51 p, 14 fig, 5 tab. OWRR A-031-ALAS(6).

Descriptors: Hydrology, Runoff, *Precipitation(Atmospheric), Evapotranspiration, *Arctic, *Alaska, Permafrost, *River basins, Snow, *Streamflow, Evaporation, Hydrologic data.

In 1969, a study of the water resources of Alaska's Arctic was initiated in response to the area's large scale petroleum exploration and extraction activities. A summary of the work is presented through a discussion of the basic features of the hydrologic system; the physical system, climatic input, and hydrologic output, with particular emphasis given to the Kuparuk, the Sagavanirktok, and the Putuligayuk Rivers. Precipitation acts as the controlling input function for the overall system. It occurs as snowfall in the eight winter months and as rainfall in June, July, August, and most of September. Comparison of precipitation records are made for Barrow, Barter Island and Prudhoe Bay. Other input variables which were examined are solar radiation, wind speed, and temperature. The output variables of the hydrologic system are evaporation and streamflow. Streamflow values collected by the U.S. Geological Survey for a two to three year period for the Putuligayuk, the Kuparuk, the Sagavanirktok Rivers indicate peak values and approximate summer mean values of 25, 20 and 20 cfs/mi2 and .01, 0.1, 1.0 cfs/mi2 respectively. The streamflow begins with a precipitous rise at the beginning of June and recedes to a sustained amount for the remainder of the summer until September after which the winter flow becomes nearly negligible. The most severe restriction on hydrologic studies in this and other arctic areas is the lack of long term data.
W74-04304

A DETAILED INVESTIGATION OF THE SOCIOLOGICAL, ECONOMIC, AND ECOLOGICAL ASPECTS OF PROPOSED RESERVOIR SITES IN THE SALT RIVER BASIN OF KENTUCKY,
Kentucky Water Resources Inst., Lexington.
S. E. Neff, L. A. Krumholz, J. R. Baker, D. E. Jennings, and A. C. Miller.
Available from National Technical Information Service as PB-227 920 $3.75 in paper copy, $1.45 in microfiche. Research Report No 67, 1973. 64 p, 2 fig, 6 tab, 18 ref. OWRR B-022-KY(1). 14-31-0001-3286.

Descriptors: *Kentucky, *Reservoir sites, *Pre-impoundment, *Benthos, Fish, *Aquatic habitats, Limnology, *Water quality, Environmental effects, Natural resources, Benefits, Planning, Population, *Social adjustment, Economics, Sulfates, Phosphates, Alkalinity, Hardness(Water), Turbidity, Specific conductivity, Mussels, Coddisflies, Drift.
Identifiers: *Salt River basin(Ky.).

Samples of water, bottom fauna, and fishes were collected from 66 stations in the Salt River and one of its principal tributaries, the Beech Fork and its tributary the Chaplin River, Kentucky. Precipitation ranged from 38.86 inches (1969) to 58.04 inches (1970), an increase of nearly 50 percent with marked fluctuations in discharge. Intensive comparisons of phosphates, sulfates, specific conductance, total alkalinity, total hardness, and turbidity showed the streams to be relatively clean and healthy. Nearly 300 different kinds of benthic organisms and other macroinvertebrates have been collected and identified from the basin. Detailed studies of caddisflies and stream drift are under way along with the development of computer programs for diversity indices of the various organisms. Twenty-eight species of bivalve mussels and representatives of six genera of snails have been collected including the Asiatic clam Corbicula mulleri. Among the vertebrates, 60 species of fishes have been collected and identified along with 22 amphibians and 21 reptiles. Nearly 150 species of birds have been identified in the area. An economic study of Spencer County revealed that there has been a decrease in the human population along with a general decline in the overall economic picture of the county as indicated by a retarded rate of growth in annual per capita income and a decline in total retail sales within the county over the past decade. The highway system in the county consists largely of Class 4,5, and 6 roads whic, because of the topography, are generally narrow, crooked, and hilly. (Grieves-Kentucky)
W74-04310

A REVIEW OF OCEANOGRAPHIC VARIABLES AND THEIR ANALYSES AND PREDICTIONS OVER THE CONTINENTAL SHELF,
Fleet Numerical Weather Facility, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W74-04329

RECHARGE OF A CENTRAL ALASKA LAKE BY SUBPERMAFROST GROUNDWATER,
Alaska Univ., College.
For primary bibliographic entry see Field 2F.
W74-04394

STATISTICAL ANALYSIS OF HYDROGRAPH CHARACTERISTICS FOR SMALL URBAN WATERSHEDS,
Tracor, Inc., Austin, Tex.
D. W. Hamm, C. W. Morgan, and H. A. Reeder.
Available from the National Technical Information Service as PB-228 131, $5.00 in paper copy, $1.45 in microfiche. Completion Report Document Number T73-AU-9559-U, October 1973. 155 p, 10 fig, 13 tab, 4 ref, 3 append. OWRR C-3286 (No 3737) (1).

Descriptors: *Unit hydrographs, *Synthetic hydrographs, *Rainfall-runoff relationships, Precipitation excess, Channel improvement, Peak discharge, Storm runoff, Equations, *Statistical models, Model studies, Regression analysis, Small watersheds, Watersheds(Basins).
Identifiers: *Urban watersheds, Confidence limits, Nomograms, Impervious cover, Time of rise, Correlation coefficient.

The purpose was to obtain equations which predict the 30-minute unit hydrograph for small urban watersheds. Equations were derived for models of the product form that correlate basin topographical features with hydrographic parameters. The models were transformed by natural logarithms so that linear regression methods could be used to obtain estimates of the exponents in the equations. The equations were applied to a wide variety of watersheds to demonstrate their validity. Confidence intervals were derived for the estimation of each hydrographic parameter. Nomograms were supplied to provide fast and accurate solutions for each equation.
W74-04459

PREDICTION OF THE 1972 MANAGUA, NICARAGUA, EARTHQUAKE FROM GROUNDWATER CHANGES, INFERRED PROBABILITY OF EARTHQUAKES IN THE CITY OF MANAGUA, NICARAGUA, DURING THE SUMMER OF 1973,
Santos and Heilemann, Managua (Nicaragua).
For primary bibliographic entry see Field 2F.
W74-04467

LINEAR SYSTEMS TECHNIQUE APPLIED TO HYDROLOGIC DATA ANALYSIS AND INSTRUMENT EVALUATION: A CASE STUDY ON DATA FROM THE ALICE SPRINGS AREA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
P. S. Eagleson, and M. J. Goodspeed.
Available from NTIS, Springfield, Va. 22151 PB-223 330 Price $5.25 printed copy; $1.45 microfiche. Technical Paper No 34, 1973. 60 p, 39 fig, 10 tab, 27 ref, append.

Descriptors: *Systems analysis, *Instrumentation, *Rainfall-runoff relationships, *Australia, Frequency analysis, Stream gages, Rain gages, Hydrograph analysis, Data collections, Network design, *Hydrologic data.
Identifiers: *Linear systems analysis, Spectral analysis.

Methods of linear systems analysis were applied to questions of instrumentation adequacy and rainfall-runoff relations for a network of experimental catchments in the Alice Springs area, Australia. The methods used are given in detail. Sufficient data are not yet available for more than tentative conclusions to be drawn regarding rainfall-runoff relations. It is concluded that the instrumentation is adequate in performance for the purpose intended. Applicability of the techniques to other situations is discussed. (Knapp-USGS)
W74-04470

INTERNATIONAL DECADE OF OCEAN EXPLORATION.
National Science Foundation, Washington, D.C. Office for the International Decade of Ocean Exploration.
For primary bibliographic entry see Field 6E.
W74-04473

TOPOLOGY OF RIVER SYSTEMS AND HYDROGRAPHIC INDICATOR STUDIES (TOPOLOGIYA RECHNYKH SISTEM I GIDROGRAFICHESKIYE INDIKATSIONNYYE ISSLEDOVANIYA),
I. N. Gartsman.
Vodnyye Resursy, No 3, p 109-124, 1973. 2 fig, 1 tab, 34 ref.

Descriptors: *Geomorphology, *Topography, *River systems, *Drainage systems, *Hydrography, Systems analysis, Statistical models, Equations.
Identifiers: *USSR.

Basing hydrography on a systems approach to a river network is an effective scientific method of study. The history of development of the systems approach under the impetus supplied by Horton is reviewed, and ways are indicated for further improvement of topological analysis of river systems through formulation of dynamic models. Emphasis is placed on the need for a separate study of the drainage and transport systems of a river network. (Josefson-USGS)
W74-04578

HYDROLOGIC INVESTIGATION AND DESIGN IN URBAN AREAS--A REVIEW,
Snowy Mountains Engineering Corp., Cooma (Australia).
A. P. Aitken.
Australian Water Resources Council Technical Paper No 5 1973. 79 p, 9 fig, 11 tab, 10 append. Research Project 71/21.

Descriptors: *Urban hydrology, *Australia, *Reviews, Research and development, Data collections, Rainfall-runoff relationships, Urban runoff, Urbanization, Gaging, Urban drainage, Rational formula.

Urban hydrologic practices and research in Australia, United States of America, France, and the United Kingdom are reviewed. It is recommended that a deterministic mathematical model for urban catchments in Australia be developed, that a program involving the collection and analysis of rainfall, runoff, and water quality data in Australian cities be implemented, and that an Australian urban hydrology manual be compiled. The Rational Formula is most commonly used for computing flood discharges in Australia, but the coefficient of runoff cannot be objectively determined for any locality because of lack of data. The Road Research Laboratory (RRL) Hydrograph Model has been used for some catchments but is unsuitable in many localities and has not been tested sufficiently in others. Only in the United Kingdom, where it appears the RRL Hydrograph Model has gained wide acceptance, has there been a significant departure from traditional methods. Deterministic mathematical models have been developed in the United States of America, and these models have already been applied to some urban catchments. Research is being carried out on development of better instruments for recording rainfall, discharge, and water quality. In addition, research into the effect of urbanization on the environment is sponsored. A significant amount of current research in urban hydrology in the United States is related to solving water pollution problems. (Knapp-USGS)
W74-04597

THE WATER BALANCE IN ARCTIC AND SUBARCTIC REGIONS--ANNOTATED BIBLIOGRAPHY AND PRELIMINARY ASSESSMENT,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04601

2B. Precipitation

HURRICANE STORM SURGE CONSIDERED AS A RESONANCE PHENOMENON,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 2L.
W74-04332

HURRICANE TIDE PREDICTION FOR NEW YORK BAY,
Texas A and M Univ., College Station. Dept. of Oceanography and Meteorology.
For primary bibliographic entry see Field 2L.
W74-04343

TRANS-PACIFIC FALLOUT AND PROTECTIVE COUNTERMEASURES,
Oak Ridge National Lab., Oak Ridge, Tenn.
For primary bibliographic entry see Field 5B.
W74-04454

WORLD DESERTIFICATION: CAUSE AND EFFECT. A LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 3B.
W74-04461

SUMMARY REPORT OF METROMEX STUDIES, 1971-1972.
Illinois State Water Survey, Urbana.
Report of Investigation 74. 1973. Floyd A. Huff, editor. 169 p, 104 fig, 46 tab, 71 ref. NSF-GA-28189X, GI-33371, GI-3871, and AEC-1199.

Descriptors: *Cloud physics, *Urban hydrology, *Missouri, *Climatology, *Weather modification, Climatic data, Atmosphere, Clouds, Storms, Synoptic analysis, Weather data, Precipitation(Atmospheric), Humidity, Rainfall.
Identifiers: Metromex studies, *St. Louis(Missouri).

Metromex is an investigation of inadvertent weather modifications resulting from an urban environment. Findings are summarized from analyses of data collected during the first two years of the 5 year field operation, located in St. Louis. Primary focus is climatological--statistical analyses of surface studies, including studies of seasonal and storm rainfall, synoptic storm types, thunderstorms, hail, surface raincells, measurements of condensation nuclei and raindrop distributions, wind, temperature, humidity, and urban effects on surface and groundwater quality. Results indicate that rain, thunderstorms, and hail maximize in both intensity and duration at locations 10 to 15 miles downwind of an urban-industrial region. Limited analyses of atmospheric studies are also included. One indicated effect of heat and other emissions generated by an urban area is the presence of higher cloud bases than those found in rural regions. (Hoffman-North Carolina)
W74-04509

ELECTRIC CLOUD AND WEATHER MODIFICATION WITH INTENSE RELATIVISTIC ELECTRON BEAMS,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 3B.
W74-04604

DRASTIC BEACH CHANGES IN A LOW-ENERGY ENVIRONMENT CAUSED BY HURRICANE BETSY,
Florida State Univ., Tallahassee. Oceanographic Inst.
For primary bibliographic entry see Field 2J.
W74-04756

MODELING OF TURBULENT TRANSPORT IN THE SURFACE LAYER,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 2D.
W74-04795

2C. Snow, Ice, and Frost

ACCUMULATION ON THE DEVON ISLAND ICE CAP, NORTHWEST TERRITORIES, CANADA,
London School of Economics and Political Science (England).
R. M. Koerner.
Available from NTIS as AD-685 348 for $3.00 paper copy, $1.45 microfiche. Journal of Glaciology, Vol 6, No 45, p 383-392, October 1966. 6 fig, 1 tab, 4 ref.

Descriptors: *Canada, *Glaciers, Ice, *Winds.
Identifiers: *Ice caps, *Devon Island(Canada), Snow transport, Katabatic winds, Baffin Bay, Cyclonic activity, *Snow accumulation.

The pattern of accumulation on the Devon Island ice cap is described. There is an area of minimum accumulation encircling the highest part of the ice cap and 100-200 m below it. Below this zone, accumulation gradually increases to a maximum near the ice-cap edge. The overall pattern is related to snow transport by katabatic winds. There is a regional accumulation pattern of high accumulation (ca. 40.0 cm. water equivalent) in the south-east part of the ice cap and an area of low accumulation (ca. 11.0 cm. water equivalent) in the north-west. This east-south-east to west-north-west accumulation gradient is related to cyclonic activity to the east in Baffin Bay, and it is probably intensified by the presence of open water in the same area. (Sinha-OEIS)
W74-04325

PERMAFROST: NORTH AMERICAN CONTRIBUTION TO SECOND INTERNATIONAL CONFERENCE.
International Conference on Permafrost, 2nd, Yakutsk, USSR: 1973, National Academy of Sciences, Washington, D.C., 1973. 783 p.

Descriptors: *Permafrost, *North America, *Conferences, Frozen ground, Ice, Frozen soils, Engineering, Environment, Reviews, Design, Frost action, Subsidence, Freezing, Thawing, Cryology.

The scope of the second conference includes consideration of environmental, ecological, and resource development issues. Summary review papers cover the seven main conference topics. The topics are: thermal aspects; distribution; genesis, composition, and structures; physics, physical chemistry, and mechanics; groundwater; surveying and predicting; and engineering and construction. (See also W74-04347 thru W74-04423) (Knapp-USGS)
W74-04346

THERMAL CONDITIONS IN PERMAFROST--A REVIEW OF NORTH AMERICAN LITERATURE,
National Research Council of Canada, Ottawa (Ontario).
L. W. Gold, and A. H. Lachenbruch.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 3-25, 1973. 5 fig, 1 tab, 117 ref, append.

Descriptors: *Permafrost, *Reviews, *Temperature, *Heat flow, *Publications, Geothermal studies, Heat transfer, Heat budget, Frozen soils, Frozen ground.

Thermal conditions in permafrost are reviewed in two sections, the surface boundary condition and subsurface thermal conditions. In principle, the ground thermal regime can be determined for any time at a given location if the boundary conditions are specified. A particularly complex set of conditions exists at the surface where the earth is in contact with the atmosphere. At this boundary the temperature is continually changing in order to maintain a balance between heat lost or gained by radiation, evaporation, convection, conduction, and precipitation. The most satisfactory method of establishing this upper boundary condition appears to be by direct measurement of the temperature at some depth with respect to the surface. Superimposed on the effects of changes in surface temperature are those due to heat flow from the interior of the earth. Although this amount of heat is

small relative to the cyclical contributions at the surface, it has a significant influence on the temperature gradient at depths greater than that to which the annual temperature changes propagate and, therefore, on the thickness of permafrost. Temperature changes and their effects in porous ground are complicated by movement of the fluid and gaseous phases of water. Additional complicating effects are caused by the phase change that occurs in bulk water at 0 deg C and at lower temperatures for water under the influence of the surface of the solid. Good progress has been made in taking into account phase changes in ground temperature calculations and in understanding their effects on the ground thermal regime, but both the qualitative and quantitative understanding of the contribution and effects of water and vapor movement are still in a primitive state. (See also W74-04346) (Knapp-USGS)
W74-04347

INFLUENCE OF CLIMATIC AND TERRAIN FACTORS ON GROUND TEMPERATURES AT THREE LOCATIONS IN THE PERMAFROST REGION OF CANADA,
National Research Council of Canada, Ottawa (Ontario).
R. J. E. Brown.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 27-34, 1973. 10 fig, 1 tab, 5 ref.

Descriptors: *Permafrost, *Temperature, *Terrain, Frozen ground, Frozen soils, Freezing, Thawing, *Canada, Arctic, Data collections, Heat flow, Geothermal studies.

Regular periodic measurements (at least monthly) of ground temperatures are being taken at three locations in northern Canada to assess the influence of climatic and terrain factors on permafrost. These are Thompson, Manitoba, situated in the southern part of the discontinuous permafrost zone, Yellowknife, Northwest Territories, in the northern part of the discontinuous permafrost zone, and Devon Island, located in the Canadian Arctic Archipelago (Queen Elizabeth Islands) in the northern part of the continuous zone. Ground temperature measurements with thermocouple cables down to the 15-m depth in various types of terrain are being taken at these locations and analyzed to determine the range of mean annual ground temperatures that may exist at any one site in the permafrost region. Mean annual ground temperatures at depths down to 15 m may differ over a 2 deg C range among various types of terrain at any one location in the permafrost region. These variations are reflected in different depths of active layer that may range from less than 0.5 m to more than 2 m, even in the northern part of the continuous zone. Variations greater than 1 deg C may occur even between sites only a few tens of meters apart. These local differences can reflect significant differences in the extent and thickness of permafrost and the susceptibility to thawing. (See also W74-04346) (Knapp-USGS)
W74-04348

DEEP TEMPERATURE OBSERVATIONS IN THE CANADIAN NORTH,
Department of Energy, Mines and Resources, Ottawa (Ontario). Earth Physics Branch.
A. S. Judge.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 35-40, 1973. 3 fig, 22 ref.

Descriptors: *Permafrost, *Temperature, *Geothermal studies, *Canada, Arctic, Data collections, Wells, *Boreholes, Heat flow, Heat budget.

Boreholes of depths of 300 m or more are used for temperature observations at 22 locations in Canada within permafrost. In addition, multisensor cables were installed in 17 boreholes, varying in depth from 20 to 60 m. The thickest permafrost measured in Canada is 530 m at Winter Harbour on Melville Island, in a well only 1,000 m from the present shoreline. Thicknesses of 1,000 m should exist on the basis of known rock types, surface temperature distribution, and a postulated regional heat flow distribution based on values measured in southern Canada. Very thick permafrost is to be expected if low surface temperatures occur in the areas of exposed shield rocks, or of shield rocks beneath present icecaps, and in areas where the Arctic Platform is overlain by dolostones and quartz sandstones. Measured thicknesses in the arctic islands range from 275 to 530 m. A thickness of over 400 m was projected in northern Quebec based on temperatures to depths of 260 m and a thickness of 360 m measured on Richards Island in the Mackenzie Delta. Permafrost thicker than 300 m probably occurs extensively through the shield of northern Keewatin District, since surface temperatures are -10 deg C or lower. Some permafrost occurrences have been reported to the south of the present 0 deg C surface temperature isotherm. (See also W74-04346) (Knapp-USGS)
W74-04349

A GENERAL SOLUTION FOR THE TWO-DIMENSIONAL, TRANSIENT HEAT CONDUCTION PROBLEM IN PERMAFROST, USING IMPLICIT, FINITE DIFFERENCE METHODS,
Brown and Root, Inc., Houston, Tex.
R. M. Kliewer.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 41-51, 1973. 7 fig, 1 tab, 2 ref.

Descriptors: *Permafrost, *Heat flow, *Computer programs, Thawing, Freezing, Finite element analysis, Consolidation, Frost heaving, Subsidence, *Conduction, *Heat transfer.

A computer programming technique is presented for mathematically modeling a large class of problems involving the thermal response of a permafrost medium. Allowance was made for seasonal temperature variation at the surface and also for the addition of extraneous thermal disturbances. This permits prediction of the effect of thermal disturbances on the natural variation of temperature in the permafrost. There is a provision for handling a stratified permafrost medium having layers possessing different thermal properties. Consideration was also given to changes of thermal properties with freezing and thawing, and the latent heat of fusion was taken into account. (See also W74-04346) (Knapp-USGS)
W74-04350

THERMAL DISTURBANCE DUE TO CHANNEL SHIFTING, MACKENZIE DELTA, N.W.T., CANADA,
Carleton Univ., Ottawa (Ontario).
M. W. Smith, and C. T. Hwang.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 51-60, 1973. 6 fig, 2 tab, 16 ref.

Descriptors: *Permafrost, *Alluvial channels, *Thawing, *Freezing, *Heat flow, Mathematical models, *Canada, Finite element analysis.

The geomorphological pattern of permafrost distribution was studied under a shifting river channel and the process was analyzed quantitatively in the framework of heat conduction theory. At present, the Mackenzie river is cutting into a spruce-covered surface in excess of 300 years old (as indicated by tree cores) on the outside bends of meanders, with consequent degradation of permafrost. The talik, which exists beneath the river, follows the river migration. Also as the cut bank recedes, new deposits are formed on the slipoff slope, and, under the influence of low-mean annual surface temperatures, permafrost will form. The process of geomorphic change is accompanied by a vegetation succession that produces a complex interaction between topography, vegetation, microclimate, and ground temperatures. The calculated variations in permafrost distribution compare well with field measurements and, in a qualitative sense, with those reported in the literature. The finite element formulation of the heat conduction equation provides good temperature predictions and demonstrates the consistency of the ground temperature field in the framework of heat conduction theory. The use of a temperature wave to simulate the river migration yields satisfactory results. (See also W74-04346) (Knapp-USGS)
W74-04351

ECOLOGICAL EFFECTS OF RIVER FLOODING AND FOREST FIRES ON PERMAFROST IN THE TAIGA OF ALASKA,
Forest Service (USDA), College, Alaska. Inst. of Northern Forestry.
L. A. Viereck.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 60-67, 1973. 7 fig, 1 tab, 26 ref.

Descriptors: *Permafrost, *Freezing, *Thawing, Floods, Forest fires, Ice, Frozen ground, Vegetation effects, Silting, Ecology, *Alaska.
Identifiers: *Taiga(Alaska).

In the taiga of Alaska, permafrost and vegetation are closely related. In areas underlain by permafrost, the nature of the vegetation is important in determining the thickness of the active layer. In a black spruce stand, the active layer is normally 30-60 cm thick. Flooding has several effects on the vegetation-permafrost relationship on floodplain forest stand. Flooding and water table rise by warm water can quickly thaw existing permafrost or cause higher soil temperatures over at least the upper 150 cm of the substrate. Siltation during flooding results in the compaction and death of the moss layers, thus reducing their insulating value in summer which results in higher soil temperatures and an increase in thickness of the active layer. The results of thawing of frozen layers heavily laden with ice can be surface subsidence, tipping of trees, and eventually the formation of thaw ponds. In some cases, flooding over permafrost results in a separation of the organic layer at the permafrost boundary and a compression and rolling of the organic layer into peat mounds. Fire in forest types underlain by permafrost results in a temporary thickening of the active layer. For the first 15 years after fire, thaw is more than 1 m; return to preburn thaw levels takes about 50 years. (See also W74-04346) (Knapp-USGS)
W74-04352

DISTRIBUTION OF PERMAFROST IN NORTH AMERICA AND ITS RELATIONSHIP TO THE ENVIRONMENT: A REVIEW, 1963-1973,
National Research Council of Canada, Ottawa (Ontario).
R. J. E. Brown, and T. L. Pewe.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 71-100, 1973. 8 fig, 1 tab, 284 ref.

Descriptors: *Permafrost, *North America, *Reviews, *Bibliographies, Frozen soils, Frozen ground, Ice, Distribution patterns, Canada, United States, Alaska, Cryology, Publications.

This review summarizes progress since 1963 in knowledge of the distribution of permafrost and the relation of environmental factors in North America. The extent of the discontinuous and continuous permafrost zones in Canada has been generally determined during the past 10 years, although detailed local information is still sparse in all but a few areas. The general distribution of permafrost in Alaska was known prior to 1963, while investigations in Greenland were initiated at about that time. The relationship of permafrost distribution and occurrence to climatic and terrain factors has received much attention in the past decade,

resulting in steady improvement in the ability to predict permafrost conditions in areas not previously investigated. The general correlations are now known, but much refining remains to be done. Four significant features of the investigations in North America during the past 10 years, relating to distribution of permafrost and its relationship to the environment, are the awareness of submarine permafrost extending under the seas in northern coastal areas; the origin, distribution, and amount of ground ice, especially massive ice; the increasing interest in features denoting the distribution of permafrost in past geological periods; and the distribution of permafrost at high elevations in the mountainous areas of western Canada and the United States. (See also W74-04346) (Knapp-USGS)
W74-04353

A GEOECOLOGICAL TERRAIN ANALYSIS OF DISCONTINUOUSLY FROZEN GROUND IN THE UPPER MACKENZIE RIVER VALLEY, CANADA,
Department of the Environment, Edmonton (Alberta).
C. B. Crampton, and N. W. Rutter.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 101-105, 1973. 8 fig, 2 ref.

Descriptors: *Permafrost, *Surveys, *Aerial photography, *Terrain analysis, Geomorphology, Frozen ground, Ice, Frozen soils, Engineering, Arctic, *Canada.

Aerial photographs may be used for rapid identification of terrain types in terms of surficial geology, microrelief, and vegetation, which is significant regarding permafrost conditions. High forest is indicative of freely drained sites, such as alluvial terraces, fans, and glaciofluvial deposits, and sand dunes, which offer the best construction sites. Relatively featureless flats on aerial photographs, though often with local reticulate bogs, are indicative of seasonally waterlogged lands on lacustrine or till deposits that present the engineer with problems typical of permafrost-free areas. However, where the terrazoid pattern can be seen on aerial photographs, raised peat with near-surface permafrost and ground ice is intricately associated with pools, often without permafrost. These patterns are characteristic of lacustrine and till deposits that contain ground ice. On uplands, with characteristic till morphology, a deranged drainage pattern on flats, especially a subparallel drainage pattern on slopes delineated by lichen on raised parts and Sphagnum in drainage runnels, in indicative of a shallow permafrost table and ground ice. These areas are best avoided for most construction purposes. (See also W74-04346) (Knapp-USGS)
W74-04354

A SPATIAL CORRELATION BETWEEN PLANT DISTRIBUTION AND UNFROZEN GROUND WITHIN A REGION OF DISCONTINUOUS PERMAFROST,
Alberta Univ., Edmonton.
D. Gill.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 105-113, 1973. 9 fig, 8 ref.

Descriptors: *Permafrost, *Canada, *Arctic, *Vegetation effects, Frozen ground, Freezing, Thawing, Alluvial channels, Erosion, Geomorphology.

Some locations in the Mackenzie Delta are underlain by taliks, and hypotheses are given for their existence. There is a close areal relationship between the distribution of these taliks and the distribution of one discrete plant association. Taliks under youthful slipoff slopes in the Mackenzie Delta undergo spatial variations over time. The freezing isotherm should be prograding into the taliks from the adjacent large cells of permafrost such as that situated below the Salix-Alnus and Picea associations. The process of frost accretion is slow and probably parallels or lags behind the progradation of slipoff slopes, depending on the rate at which individual channel segments shift. Since permafrost is currently degrading along cut banks opposite such locations, it is clear that the formation and decay of perennially frozen ground in the Mackenzie Delta is a dynamic process that sees major areal displacements of permafrost bodies through time. (See also W74-04346) (Knapp-USGS)
W74-04355

INDIRECT MAPPING OF THE SNOWCOVER FOR PERMAFROST PREDICTION AT SCHEFFERVILLE, QUEBEC,
McGill Univ., Schefferville (Quebec). McGill Sub-Arctic Research Lab.
H. B. Granberg.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 113-120, 1973. 8 fig, 18 ref.

Descriptors: *Permafrost, *Snow cover, *Mapping, Mining, *Canada, *Aerial photography, Surveys.

Two different techniques of indirect mapping of the snowcover are useful in delineating permafrost in the Schefferville area of Quebec. A method based on sequence melt photographs is suitable for permafrost prediction on a regional scale, where only the surficial extent of permafrost is considered. Three to four flights, evenly spaced through the first 150 cm of snow depth decrease, are sufficient to obtain good information about the spatial variations in snow accumulation for the particular year. When there are appreciable regional differences in melt rates within the area photographed, additional snow measurements are required for calibration of the class limits. A computerized model was developed for more detailed work where the actual geometry of permafrost is important. A particular advantage of this model is its suitability for further modeling of the thermal effects of the snowcover and other topographically related factors. Empirical equations were determined for the influence of the seasonal snowcover on ground temperatures. (See also W74-04346) (Knapp-USGS)
W74-04356

PERMAFROST AND ITS RELATIONSHIP TO OTHER ENVIRONMENTAL PARAMETERS IN A MIDLATITUDE, HIGH-ALTITUDE SETTING, FRONT RANGE, COLORADO ROCKY MOUNTAINS,
Colorado Univ., Boulder.
J. D. Ives.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 121-125, 1973. 4 fig, 1 tab, 14 ref.

Descriptors: *Permafrost, *Colorado, *Alpine, Frozen ground, Frozen soils, Heat budget, *Rocky Mountain Region, Climatology.

Permafrost occurs throughout the Colorado Rocky Mountains. One of the most important environmental parameters in this high-altitude and relatively low-latitude region is incoming shortwave radiation and hence slope angle and aspect; another is the interrelationships of wind, snow distribution, and topography. At elevations of 3,500 m and above, immediately above treeline, patches of permafrost should be expected under wet sites that are largely blown free of snow during winter. Thickness of the active layer may be less than 2 m and freezeback to the permafrost table may not be complete until mid-February or early March. There will be no permafrost under dry sites, south-facing slopes, and snow-accumulation sites. The highest summits of the Front Range (4,000-4,400 m), with an extrapolated mean annual air temperature of about -9 deg C for 4,400 m, should be extensively underlain by permafrost of considerable thickness. The predominantly dry conditions and extensive areas of bedrock outcrop severely limit the accumulation of significant amounts of ground ice. Nevertheless, the possible presence of permafrost is sufficient to indicate that any mountain development should take it carefully into account. (See also W74-04346) (Knapp-USGS)
W74-04357

POSTGLACIAL PERMAFROST FEATURES IN EASTERN CANADA,
Laval Univ., Quebec.
D. Lagarec.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 126-131, 1973. 7 fig, 12 ref.

Descriptors: *Permafrost, *Paleoclimatology, *Canada, Geomorphology, Terrain analysis, *Aerial photography, Frozen ground, Frost action.
Identifiers: Quebec.

Circular mounds and flat-bottomed depressions observed in aerial photographs of northern Quebec were formed by postglacial permafrost. Other features include polygonal cracking of a uniform surface in blocks 10-20 m long, formation of flat-topped and steep-sided mounds by erosion along the cracks, and smoothing of mound slopes by sliding of side material. These observations in northern Quebec appear to corroborate those made in the Soviet Union and lead to the conclusion that in southern Quebec similar features were formed under similar conditions, namely discontinuous permafrost and cold humid climate with a mean annual air temperature of -2 to -4 deg C, meaning 5-7 deg C cooler than the present temperature. (See also W74-04346) (Knapp-USGS)
W74-04358

THE OCCURRENCE AND CHARACTERISTICS OF NEARSHORE PERMAFROST, NORTHERN ALASKA,
R. I. Lewellen.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 131-136, 1973. 3 fig, 2 tab, 7 ref.

Descriptors: *Permafrost, *Beaches, *Alaska, *Beach erosion, Water temperature, Frozen ground, Barrier islands, Sedimentation.
Identifiers: Undersea permafrost.

Permafrost is known to occur under the coastal waters of the Chukchi and Beaufort seas north of Alaska. Sea level, at or near the present level for the past years, can simulate eustatic change by the thermal erosion of the coastline. Rates of erosion ranging from 10 to 30 m per year, although operational only for the brief open-water period, can account for shoreline changes of 5-15 km in just 500 years in the Beaufort Sea region. With mean annual bottom water temperatures below -1.0 deg C, there are expected to be considerable expanses of offshore permafrost. As the seawaters transgress the coast, the bottom elevations move farther below sea level with distance away from the shoreline. This is transgression by thermal erosion or truncation without a tectonic or eustatic change. The change in bottom elevation is due, in part, to thaw subsidence and consolidation. On parts of these thermally truncated or thermal planation benches, storm waves and weak currents and tides winnow and scour fine material. As the sea thermally truncates the land, modifications to the existing permafrost, at or below the level of truncation, are in the form of mean annual surface temperature change and the possible circulation of seawater in the new seasonal thaw layer. In general, a warmer but still negative mean annual temperature prevails after the shoreline passes. If the sea level has been oscillating only 1-3 m around the present level for the past 3,000 or 4,000 years, and if allowances are made for changes in coastal erosion rates, extensive areas of truncated permafrost must still exist under the Beaufort Sea floor. (See also W74-04346) (Knapp-USGS)

W74-04359

GEOPHYSICAL IDENTIFICATION OF FROZEN AND UNFROZEN GROUND, ANTARCTICA,
Northern Illinois Univ., De Kalb.
L. D. McGinnis, K. Nakao, and C. C. Clark.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 136-146, 1973. 9 fig, 3 tab, 21 ref.

Descriptors: *Permafrost, *Antarctic, *Geophysics, *Resistivity, *Seismic studies, Electrical studies, Frozen ground, Salinity.

Geophysical measurements in the dry valleys of Antarctica reveal abnormally thin permafrost with respect to the present climate. Presuming a normal continental geothermal gradient of about 18 deg C/km, permafrost thicknesses should be on the order of 1 km. From laboratory studies, field observations, and theoretical analyses, it is inferred that the lack of development of thick confining permafrost is due to the presence of solar-heated lakes, which were much more extensive in the recent past, and to high water and soil salinities. Even where permafrost soil temperatures are present, the high soil salinities depress the freezing point to such a degree that the permafrost remains unfrozen in some locations and permits the movement of pore fluids. Beginning with Taylor Glacier in western Taylor Valley and extending eastward to the coast, all geophysical studies conducted indicate a layer of thin permafrost overlying unfrozen sediment. Along the tongue of Taylor Glacier, confining permafrost extends to depths greater than the maximum depth of exploration (150 m). East of Lake Bonney, confining permafrost is 20-30 m thick but is underlain by saturated, unfrozen sediment. In Wright Valley, thin permafrost or a lack of permafrost altogether, may extend from Don Juan and Don Quixote ponds in the west to eastern Lake Vanda. Thick permafrost is associated with thin sediment cover east of the lake; however, electrical measurements indicate that thin permafrost again prevails in the vicinity of Bull Pass. Victoria Valley and Lake Vida are underlain by thick and extensive permafrost. A thin layer of entrapped brine or low resistivity soil may rest on the bottom of Lake Vida as suggested by a long Schlumberger resistivity station. (See also W74-04346) (Knapp-USGS)
W74-04360

PERMAFROST CONSIDERATIONS IN LAND USE PLANNING MANAGEMENT,
Bureau of Land Management, Anchorage, Alaska.
C. V. McVee.
In: International Conference on Permafrost 2 nd, Yukutsk, USSR, 1973. p 146-151, 1973. 5 fig, 6 ref.

Descriptors: *Land use, *Permafrost, *Land management, Subsidence, Erosion, Conservation, *Arctic.

Permafrost is a dominant factor that must be considered by the land manager in the Arctic. Conventional resource utilization and extraction techniques must be modified to compensate for this physical phenomenon. Prior to implementing resource utilization and extraction activities, the land manager must be aware of the eventual implications of any proposed decision and its impact on future productivity and use of each finite commodity. Even a minor surface disturbance may alter the thermal balance sufficiently to induce permafrost thawing, which may result in subsidence or soil erosion or both, and affect such features as surface relief, access, siltation, and wildlife habitat. Changes in surface relief, such as depressions from subsidence or gullies from erosion by waters of melting soil ice interfere with subsequent construction or land travel. Eroding soil solids become deposited at some lower points in the watershed or drainageway, which further limit utilization of the land. Also, siltation may adversely affect water quality and the aquatic biota. (See also W74-04346) (Knapp-USGS)
W74-04361

PERMAFROST AND SNOWCOVER RELATIONSHIPS NEAR SCHEFFERVILLE,
McGill Univ., Schefferville (Quebec). McGill Sub-Arctic Research Lab.
F. H. Nicholson, and H. B. Granberg.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 151-158, 1973. 7 fig, 3 tab, 12 ref.

Descriptors: *Permafrost, *Snow cover, Frozen ground, Ice, Snow, *Canada, Temperature, Regression analysis, Groundwater, Snowpacks, Aerial photography, Mapping.

Snow is the most important factor controlling permafrost distribution in the Schefferville area of Quebec, and there is a linear relationship between ground temperatures and snow depth. Groundwater is an important subsidiary factor. The temperature at any depth correlates best with a snow area that has a radius two times that depth. A regression equation was calculated for combinations of temperature depth and snow radius that gave the highest correlation coefficients. This equation accurately predicts presence or absence of permafrost for 82% of a sample of 123 points, and the explanation is increased to 94% if points known to be affected by groundwater are removed. The depth of snow corresponding to a ground temperature of 0 deg C was 75 cm. (See also W74-04346) (Knapp-USGS)
W74-04362

STUDIES AT THE TIMMINS 4 PERMAFROST EXPERIMENTAL SITE,
McGill Univ., Schefferville (Quebec). McGill Sub-Artic Research Lab.
F. H. Nicholson, and B. G. Thom.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 159-166, 1973. 5 fig, 1 tab, 14 ref.

Descriptors: *Permafrost, *Snow cover, *Frozen ground, Ice, Snow, *Canada, Temperature, Regression analysis, Groundwater, Snowpacks, Mapping, Geophysics, Borehole geophysics, Resistivity.
Identifiers: Schefferville(Quebec).

Snow is the most important factor controlling the distribution of the permafrost in the Schefferville area of Quebec. The active layer is normally 3-4 m thick. Several examples of active layers up to 10 m deep are found, and this greater depth of thaw is due to shallow groundwater movement. The thermal diffusivity of the ground is often very high, as evidenced by the penetration of annual temperature waves as deep as 25-30 m. Moisture contents of the frozen ground range between 3 and 40% by volume and are commonly on the order of 15%. Sharp change in physical properties of the rocks, due to the change from frozen to unfrozen state, occurs at 0 deg C. The three-dimensional pattern of the mean isotherms and the relationships between snow and ground temperatures demonstrate that lateral heat flow is particularly important. It is postulated that the present permafrost distribution in upland sites is in equilibrium with contemporary environmental conditions and that relict permafrost is not extensive. (See also W74-04346) (Knapp-USGS)
W74-04363

GEOCHEMISTRY OF PERMAFROST AND QUATERNARY STRATIGRAPHY,
Arizona State Univ., Tempe.
T. L. Pewe, and P. V. Sellmann.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 166-170, 1973. 2 fig, 1 tab, 27 ref.

Descriptors: *Permafrost, *Geochemistry, *Stratigraphy, Glacial drift, Quaternary epoch, Soils, Frozen soils, Frozen ground, Resistivity, Salinity, *Alaska.
Identifiers: *Fairbanks(Alas).

A new approach to the study of permafrost is the chemical investigation of its ice and sediments. The existing ionic concentration gradients and their lateral dimensions can be indicative of cold regions environments and provide a measure of conditions prior to the formation of the perennially frozen ground. The distribution of soluble and exchangeable ions in soils, perennially frozen ground, and sediments underlying water bodies is influenced by both the materials and the present and past depositional and leaching environments. For the same material and environments, low concentrations indicate considerable leaching or freshening and high concentrations indicate lack of these active processes or enrichment by ground or surface waters. Silts and clays retain more soluble and exchangeable ions than do sand and gravels. Ionic concentration generally increases with depth, particularly in uplifted marine sediments. In the Fairbanks area, an abrupt change in chemical concentrations of extractable cations in permafrost shows a stratigraphic unconformity in retransported sediments of Wisconsinan age. Preliminary interpretations suggest thawing and refreezing above the unconformity. (See also W74-04346) (Knapp-USGS)
W74-04364

STRATIGRAPHY AND DIAGENESIS OF PERENNIALLY FROZEN SEDIMENTS IN THE BARROW, ALASKA, REGION,
Cold Regions Research and Engineering Lab., Hanover, N.H.
P. V. Sellmann, and J. Brown.
In: International Conference on Permafrost 2nd, Yukutsk, USSR, 1973. p 171-181, 1973. 5 fig, 5 tab, 36 ref.

Descriptors: *Stratigraphy, *Permafrost, *Alaska, Soil formation, Diagenesis, Sedimentation, Sedimentology, Intertidal areas.
Identifiers: *Barrow(Alaska).

The late Quaternary history of the northern Alaskan Arctic Coastal Plain is discussed. The last major marine transgression deposited the Barrow unit in mid-Wisconsinan time. Recession, uplift, and formation of near-surface permafrost followed. The last 10,000 years is characterized by a gradual warming, active thaw-lake formation and degradation, and burial of surface peats through cryopedologic processes. (See also W74-04346) (Knapp-USGS)
W74-04365

ORIGIN, COMPOSITION, AND STRUCTURE OF PERENNIALLY FROZEN GROUND AND GROUND ICE: A REVIEW,
British Columbia Univ., Vancouver.
J. R. Mackay, and R. F. Black.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 185-192, 1973. 82 ref.

Descriptors: *Permafrost, *Frozen ground, *Reviews, Ice, Frozen soils, Arctic, Quaternary period, Freezing, Thawing, Glaciation, Paleoclimatology.

The origin of perennially frozen ground (permafrost) and ground ice on land in North America and beneath the sea floor of the Arctic Ocean reflects the geomorphic processes and the thermal variations of the late Quaternary period. Many review papers and books have been published on perennially frozen ground and ground ice since the First International Conference on Permafrost in 1963. This review emphasizes massive ground ice in a brief summary of the state of knowledge of the origin, composition, and structure of permafrost. Deficiencies of

knowledge are pointed out, and some recommendations for future study are made. (See also W74-04346) (knapp-USGS)
W74-04366

GROWTH OF PATTERNED GROUND IN VICTORIA LAND, ANTARCTICA,
Connecticut Univ., Storrs.
R. F. Black.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 193-203, 1973. 1 fig, 16 tab, 9 ref.

Descriptors: *Antarctic, *Permafrost, *Geomorphology, Ice, Frozen soils, Frozen ground, Freezing, Thawing.
Identifiers: *Patterned ground, *Ice wedges, *Antarctica(Victoria Land).

Growth of patterned ground at 14 sites in Victoria Land, Antarctica was measured over an interval of 6-8 years from 1961 to 1969. In Victoria Land, patterned ground consists of sand-wedge polygons in the inland areas and of ice-wedge polygons along the more humid coasts. These represent the end members of a continuum in which the ice content of the wedges ranges almost from 0% to 100%. Composite wedges, representing mixtures of ice, sand, and rubble, are most abundant and widespread. Surface patterns reflect growth stages from narrow sharp cracks corresponding to the initial wedges through shallow rounded depressions over each wedge to wider and deeper depressions with raised rims on each side and, finally, in some places only to an irregularly mounded or pimpled surface where the mounds represent the centers of former polygons. Polygons commonly vary from 5 to 40 m in diameter. Most of the patterned ground in Victoria Land is young, dating within the last 5,000 years (even with thermal corrections to be applied). Multicyclic wedges are recognized by the wedge-in-wedge structure, and ancient patterned ground is being exhumed today to start growing again. (See also W74-04346) (Knapp-USGS)
W74-04367

THERMOKARST DEVELOPMENT, BANKS ISLAND, WESTERN CANADIAN ARCTIC,
Ottawa Univ. (Ontario).
H. M. French, and P. Egginton.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 203-212, 1973. 9 fig, 4 tab, 41 ref.

Descriptors: *Permafrost, *Melting, *Frozen ground, *Ice, *Erosion, *Canada, Soils, Frozen soils, Land subsidence, Subsidence, Soil erosion, Karst.
Identifiers: *Thermokarst.

Some thermokarst landforms and processes are to be found on Banks Island, in the western Canadian Arctic. This island, the fourth largest in the Canadian Arctic Archipelago, lies between 71 and 75 deg N and is totally within the zone of continuous permafrost. The importance of naturally occurring thermokarst is restricted to those areas where lithological and/or soil conditions favor a high ice content, or where massive ground ice is present. The close connection that exists between thermal erosion and thermal melting is most dramatically illustrated in localized areas of badland topography that exist in close juxtaposition to well developed polygon terrain and ice-wedge junction ponds. Certain types of thermokarst such as ground ice slumping, are some of the most rapid erosional processes operating in the high Arctic at present. (See also W74-04346) (Knapp-USGS)
W74-04368

PROBLEMS IN THE ORIGIN OF MASSIVE ICY BEDS, WESTERN ARCTIC, CANADA,
British Columbia Univ., Vancouver.
J. R. Mackay.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 223-228, 1973. 6 fig, 16 ref.

Descriptors: *Ice, *Permafrost, *Arctic, *Groundwater, *Canada, Frozen ground, Aquifers, Freezing.

Massive icy beds are of widespread occurrence in the western Canadian Arctic. Natural exposures may be seen along steep coastal bluffs, river banks, lake shores, and on hill tops where disturbances have induced thawing. The prior existance of massive icy beds can also be inferred in old slump scars. The massive icy beds show every conceivable gradation from icy muds to pure ice. Most of the icy beds have grown in situ, even though some buried glacier ice may be present. The widespread occurrence of massive icy beds above, or in close association with, sands and gravels suggest that these sediments served two purposes: a water source from water expulsion resulting from freezing of adjacent coarse-grained sediments and an aquifer. Massive bodies of segregated ice grow at depth in the same manner as that of segregated ice in pingos. (See also W74-04346) (Knapp-USGS)
W74-04369

A SIMULATION SENSITIVITY ANALYSIS OF THE NEEDLE ICE GROWTH ENVIRONMENT,
Michigan Univ., Ann Arbor.
ys. i. outcalt.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 228-234, 1973. 5 fig, 3 tab, 9 ref.

Descriptors: *Frost, *Frost action, Simulation analysis, Alpine, Frost protection, Frost prevention, Freezing, Thawing, Mathematical models.
Identifiers: *Needle ice.

Simulation of needle ice behavior provides the basic analytical framework for the simulation of the tundra active layer. Needle ice is the result of diurnal ice segregation near the soil surface. Ice segregation results from the increase in the water fraction of a soil layer produced by the upward migration of soil water to the freezing plane after nucleation occurs and the freezing place remains at a fixed level in an initially unfrozen soil. The process of needle ice erosion produces downslope soil movement in periglacial alpine terrain and is responsible for damage to plant materials when freezing causes vertical mechanical stress within the root zone. Needle ice damage may be attenuated by artificially mulching seedbeds with plastic sheeting or porous sand layers (10 mm thick) to reduce the surface wetness, artificially introducing roughness elements into the seedbeds, and avoiding extremely shadowed and wet natural sites. The strategies may be of extreme importance in repairing tundra and alpine meadow cover damage in alpine recreation areas. Deterministic models are capable of mimicking natural phenomena not specifically woven into the fabric of the model structure. As the general equilibrium temperature alogorithm is spatially and temporally unconstrained dimensionally, this system of equations, when modified to include specific process information, should be applicable to the entire spectrum of periglacial phenomena. (See also W74-04346) (Knapp-USGS)
W74-04370

RATES OF MASS WASTING IN THE RUBY RANGE, YUKON TERRITORY,
Portland State Univ., Oreg.
For primary bibliographic entry see Field 2J.
W74-04371

SOIL DEVELOPMENT AND PATTERNED GROUND EVOLUTION IN BEACON VALLEY ANTARCTICA,
Washington Univ., Seattle.
For primary bibliographic entry see Field 2G.
W74-04372

PHYSICS, CHEMISTRY, AND MECHANICS OF FROZEN GROUND: A REVIEW,
Cold Regions Research and Engineering Lab., Hanover, N.H.
D. M. Anderson, and N. R. Morgenstern.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 257-288, 1973. 11 fig, 182 ref.

Descriptors: *Frozen ground, *Frost action, *Freezing, *Thawing, *Permafrost, Thermodynamics, Mass wasting, Solifluction, Soil water, Soil moisture, Water chemistry, Soil chemistry, Frozen soils, Soil physics.

Phase equilibria, thermal aspects, and physicomechanical aspects of frozen ground are reviewed. Much of the subject matter pertaining to the physics and chemistry of frozen ground derives from the nature and phenomenology of the interfaces present. The interfaces are of the following types: ice-ice (grain boundary), ice-water-air, silicate-water-silicate (primarily interlamellar), and silicate-water-ice (extralamellar). This terminology implies that, in contrast to the ice-ice interface, all the others possess a component with liquid-like characteristics. In general, water movement in frozen soil is analogous to flow in unfrozen soils, but flow is confined primarily to the unfrozen interface, and there is little or no contribution of vapor transport. Because ions and solutes tend to be rejected from the growing ice lattice, they are excluded to and confined to the domains of the unfrozen interfacial water. The mechanism of frost heaving has been the subject of many investigations. Briefly, as heat is extracted from above and freezing is initiated, growing ice crystals coalesce into planar ice lenses. The ice lenses are enlarged by the addition of water transported from the reservoirs of soil water below. Ice-lens growth occurs at locations where the temperature is favorable and the rate of appearance and dissipation of the latent heat of freezing does not exceed the flux of soil water. (See also W74-04346) (Knapp-USGS)
W74-04373

THE UNFROZEN WATER AND THE APPARENT SPECIFIC HEAT CAPACITY OF FROZEN SOILS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
D. M. Anderson, A. R. Tice, and H. L. McKim.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 289-295, 1973. 6 fig, 1 tab, 22 ref.

Descriptors: *Frozen soils, *Freezing, *Thawing, *Soil moisture, Equations, Soil water, Temperature, Thermal capacity, Heat flow, Aqueous solutions, Heat transfer.

When the thermal regime of permafrost is changed as a result of engineering operations, or because of a perturbation of the local environmental conditions, the ice-water phase composition of the frozen soils also must change. The influence of this change on the stability and function of an engineering installation can be considerable. A convenient equation is given for predicting the apparent specific heat capacity and the cumulative heat absorption versus temperature curve of frozen soils from their water-ice phase composition data. The availability of this equation facilitates the calculation of thaw and frost penetration. An equation for the apparent specific heat capacity of frozen ground incorporating the relationship expressed in the first of these is derived. Apparent specific heat capacities are calculated as a function of temperature for six representative soils at each of three water contents. In addition, representative curves that depict the cumulative heat absorbed in bringing each from -10 deg C through the melting point were

computed and are given in graphical form. (See also W74e04346) (Knapp-USGS)
W74-04374

MECHANICAL PROPERTIES OF FROZEN GROUND UNDER HIGH PRESSURE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
E. Chamberlain.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 295-305, 1973. 11 fig, 2 tab, 8 ref.

Descriptors: *Soil mechanics, *Permafrost, *Seismic studies, *Compressibility, *Frozen soils, Frozen ground, Ice, Cryology, Craters, Rock mechanics, Soil physical properties, Soil physics, Mechanical properties.

The evaluation of crater and crater formation and seismic waves in regions of permafrost requires considerable knowledge of the high pressure behavior of frozen soil and ice. The compressibility of saturated frozen soil to 30 kbar is readily predicted from knowledge of properties, such as degree of saturation with ice, porosity, and the compressibilities of ice and mineral components. The accuracy is limited at low pressures and low degrees of saturation. The behavior of the phase transformations is somewhat obscured by rate processes and the reordering and crushing of the mineral particles. Confining pressure has great influence on the shear strength of frozen soils. At a temperature of -10 deg C and a strain rate of approximately 6 percent/min, three distinct stress regions are observed: a low-pressure region of constant or increasing shear stress, a mid-pressure region of decreasing shear stress, and a high-pressure region of slightly increasing shear stress. It is suggested that four elements--interparticle friction and particle interlocking, unfrozen water content, pressure melting of ice, and the ice-water phase change--control the triaxial compression behavior of saturated frozen soils. (See also W74-04346) (Knapp-USGS)
W74-04375

EFFECT OF POROSITY ON AMOUNT OF SOIL WATER TRANSFERRED IN A FREEZING SILT,
Rutgers - The State Univ., New Brunswick, N.J.
A. R. Jumikis.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 305-310, 1973. 4 fig, 2 tab, 6 ref.

Descriptors: *Frozen ground, *Groundwater movement, *Porosity, *Freezing, *Thawing, Mass transfer, Pores, Water vapor, Thermodynamics, Soil moisture, Water chemistry, Pore water, Ice, *Soil water.

The effects of porosity of a silty glacial outwash frost-prone soil on the amount of soil moisture transferred from groundwater to the cold front (0 deg C isotherm) upon freezing were studied. The porosity is the primary factor controlling the amounts of heat flow, moisture transfer, and all the related phenomena, as clearly demonstrated by the similar trends of all the related factors plotted together as a function of porosity. Depending on the magnitude of the porosity of the soil, moisture may be transferred upward from groundwater to the cold front by way of various moisture transfer mechanisms. The effective soil moisture transfer mechanism is by way of the water-film flow (unsaturated flow) within the porosity range between 27.8% and 47.8%. The moisture transfer by the film-flow mechanism is virtually unaccompanied by vapor diffusion. Between porosities of 60% and 100%, the effective soil moisture transfer mechanism is vapor diffusion. The vapor transport mechanism, however, is an ineffective one. (See also W74-04346) (Knapp-USGS)
W74-04376

EVALUATION OF IN SITU CREEP PROPERTIES OF FROZEN SOILS WITH THE PRESSUREMETER,
Ecole Polytechnique, Montreal (Quebec).
B. Landanyi, and G. H. Johnston.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 310-318, 1973. 6 fig, 9 ref.

Descriptors: *Permafrost, *Creep, *Rheology, *Instrumentation, *Borehole geophysics, Stress, Strain, Frozen soils, Soil strength, Soil mechanics, Soil physical properties, Ice.

The Menard pressuremeter is a borehole dilatometer for in situ measurement of stress-strain and strength properties of soils and rocks. It consists of an inflatable probe, composed of two coaxial cells, and a pressure-volume control device that allows a given pressure to be applied to the wall of the borehole and the resulting volume increase of the hole to be observed. After some minor modifications, the standard pressuremeter equipment proved to be suitable for performing creep tests in permafrost. The method proved feasible for the determination of creep parameters of frozen soils in situ and the prediction of long-term strength. To obtain sufficient creep information for the proposed method to be applicable, however, it is recommended that, in addition to conventional short-term pressuremeter tests, the following two types of creep tests be performed: multistage creep tests with about 15 min per stage, and one-stage creep tests conducted at different pressure levels to check the linearity of creep lines for long-time intervals. (See also W74-04346) (Knapp-USGS)
W74-04377

SHOCK-WAVE STUDIES OF ICE AND TWO FROZEN SOILS,
California Univ., Livermore.
D. B. Larson, G. D. Bearson, and J. R. Taylor.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 318-325, 1973. 15 fig, 1 tab, 8 ref.

Descriptors: *Frozen soils, *Soil physical properties, *Cryology, Thermodynamics, Soil physics, Strength of materials, Compressibility.
Identifiers: *Shock waves.

Shock-wave experimental techniques used in conjunction with one-dimensional numerical simulation models represent a useful technique for determining high-strain-rate equations of state in studying frozen materials and provide a unique examination of the compressibilities of this important group of materials. The Ice I-water phase transformation occurs during shock-wave loading both in pure ice and in the interstitial ice in saturated frozen soils. However, the observed final loading states are all in the mixed-phase region, and unloading data imply a continuation of the transformation during the initial part of this unloading. This unloading behavior creates a large energy sink whenever decaying shock waves propagate at stress levels above 2 kbar and to at least 15 kbar and also may occur at stress levels above this range. The relatively rapid attenuation of the shock wave in frozen materials is directly related to this loss of energy. Numerical simulation models that duplicate this rate of attenuation are also consistent with the loading and unloading observed in the uniaxial compression experiments. The differences between ice and frozen soil are a direct result of a larger area between the loading and unloading paths in the soils. Reasons for this difference are a slower transformation rate upon loading, followed by relatively rapid transformation in the initial unloading or limited transformation back to Ice I after the material unloads. Temperatures behind the shock and rarefaction waves could play an important part in the reverse transformations by stabilizing part or all of the water phase. (See also W74-04346) (Knapp-USGS)
W74-04378

THAW CONSOLIDATION OF ALASKAN SILTS AND GRANULAR SOILS,
Woodward-Lundgren and Associates, Oakland, Calif.
U. Luscher, and S. S. Afifi.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 325-334, 1973. 8 fig, 11 ref.

Descriptors: *Thawing, *Consolidation, *Subsidence, *Frozen soils, *Permafrost, Soil tests, Ice, Soil mechanics, Soil physical properties, *Silts.

An extensive investigation was made of thaw consolidation behavior of undisturbed frozen silts and granular soils from Alaska. Frozen silt samples were thawed and consolidated one-dimensionally with a range of vertical pressure from 12 to 384 kN/sq m using standard consolidation test equipment; these tests involved thawing with different pressures, as well as thawing with a single pressure and consolidating further with additional pressures. Frozen silt-sand samples were thawed and consolidated by two methods--one-dimensionally in the standard odometer test and anisotropically in the standard triaxial test with vertical-to-horizontal pressure ratios of 2 and 3, thus minimizing the changes in sample cross section during thawing and consolidation. Anisotropic thaw consolidation tests were made on dirty gravels and on clean sands and gravels. Uniaxial (one-dimensional) thaw strains can be estimated from triaxial thaw consolidation, which is the usual initial step in a consolidated, undrained strength test. The same result is true for silt-sands. (See also W74-04346) (Knapp-USGS)
W74-04379

MECHANICAL PROPERTIES OF ROCKS AT LOW TEMPERATURES,
Cold Regions Research and Engineering Lab., Hanover, N.H.
M. Mellor.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 334-344, 1973. 7 fig, 3 tab, 20 ref.

Descriptors: Permafrost, *Frozen ground, *Rock mechanics, *Strength of materials, Mechanical properties, Freezing, Moisture content, Rock properties, Strength.

Rock becomes significantly stronger when it freezes. Pore water in typical rock freezes progressively, and for each rock type there is a characteristic relation between unfrozen water content and temperature which depends to a large degree on surface area. Some water, corresponding closely to the maximum adsorbed water content, remains unfrozen at temperatures of -10 deg C and lower. Thickness, continuity and mobility of interfacial water decrease with decreasing temperature down to approximately -125 deg C. Rapid initial freezing of pore water in saturated rock can cause abrupt volumetric expansion of the rock, with strains that approach the tensile failure strain. After initial freezing of pore water, the residual unfrozen water is free to migrate under potential gradients, but it will freeze and (and expand) if it migrates into large cracks or cavities. Under high hydrostatic pressure, ice contained in pores will undergo phase transformation to polymorphs of higher density. If the ice content is high, this will produce significant strain discontinuities in the compressibility curve. Low-temperature strength is affected significantly by freezing, or ordering, of adsorbed water. In tests at 23 deg C, oven-dry rock is 35-40% stronger than air-dry rock containing maximum adsorbed water; when air-dry rock with maximum adsorbed water is cooled, strength below-70 deg is 35-40% higher than strength at 23 deg C. (See also W74-04346) (Knapp-USGS)
W74-04380

SOIL FREEZING IN RELATION TO PORE WATER PRESSURE AND TEMPERATURE,
Cornell Univ., Ithaca, N.Y.
R. D. Miller.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 344-352, 1973. 10 fig, 1 tab, 7 ref.

Descriptors: *Permafrost, *Frozen soils, *Freezing, Crystal growth, Mass transfer, Soil water movement, Permafrost, Thermodynamics, Cryology, *Pore water, *Pore pressure.

In studies of saturated soil, an ice-water interface behaved in a manner analogous to the behavior of an air-water interface in the same soil. A quantitative analysis of freezing of an unsaturated soil of very simple geometry was undertaken in order to establish a vision of the stages of progressive freezing in real soils of complex geometry. It provides a detailed rationale for the fact that, when moist soil freezes, profound changes in the water content occur: Water moves from unfrozen to frozen soil, whereby the pores of the frozen zones become saturated and adjacent ice-free soil is dessicated. Under the circumstances of interest, an adsorbed film of mobile water covers the surface of a mineral particle. This film exists between the mineral particle and air or ice with which the particle is in contact. The film will be thin, of the order of tens of angstrom units. Where two particles touch, whether mineral-ice or mineral-mineral contacts, there will be additional capillary water present, essentially unaffected by adsorption forces associated with the film. If one of the particles is ice, the ice-water interface will alter its shape by melting or freezing to achieve an equilibrium interface. (See also W74-04346) (Knapp-USGS)
W74-04381

IONIC MOBILITY IN PERMAFROST,
Cold Regions Research and Engineering Lab., Hanover, N.H.
R. P. Murrmann.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 352-359, 1973. 8 fig, 2 tab, 20 ref.

Descriptors: *Permafrost, *Ion transport, *Water chemistry, *Pore water, Mass transfer, Soil moisture, Diffusion, Electrical conductance, Ice, Frozen soils, Frozen ground, Conductivity.
Identifiers: *Ionic mobility.

The mobility of ions was studied in frozen earth materials. Although ion diffusion is slower in frozen soil than in unfrozen soil, values of the diffusion coefficients in the temperature range from about 0 to -15 deg C, are high relative to those of solid state diffusion. Although the rate of ion diffusion is lower in frozen silt soil than in frozen clay at a given temperature, it increases with clay content because of the decreasing tortuosity of the soil matrix. The most important parameter influencing ion diffusion in a given soil is temperature, but the influence of temperature cannot be accounted for by the changing thermal energy of the ions. The temperature dependence for the low frequency electrical conductivity of frozen Na-bentonite is similar to that for ion diffusion. Unlike diffusion, the conductance of frozen bentonite clay increases with total water content of the sample. The enhanced conductivity is due to an increased number of charge carriers. The physical movement of ions through the frozen soil matrix and the relatively high values for diffusion coefficients can be accounted for only by the existence of continuous, thin films of interfacial water in which the molecules are relatively mobile compared with those of ice. The temperature dependence of ion diffusion and electrical conductance largely results from a higher ion mobility as interfacial films of water thicken with melting. The increase in electrical conductivity with ice content indicates that the water at silicate-water-ice interfaces is more highly dissociated than the water at silicate-water-silicate interfaces. (See also W74-04346) (Knapp-USGS)
W74-04382

SOUND AND SHOCK TRANSMISSION IN FROZEN SOILS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
Y. Nakano, and N. H. Froula.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 359-369, 1973. 10 fig, 2 tab, 47 ref.

Descriptors: *Frozen soils, *Soil physical properties, *Sound waves, Ultrasonics, Cryology, Elasticity(Mechanical), Compressibility.
Identifiers: *Shock waves.

The behavior of frozen soils under shock compression was studied by the use of a gas-gun facility. The dilatational velocities of 20-30 Ottawa sand, Hanover silt, and Goodrich clay (fully water-saturated) are presented as a function of temperature. The measurements were made by one of the pulse-transmission methods based on transmitting a short train of 1-MHz pulses and measuring its first arrival time through a circular cylindrical specimen. Unfrozen water content is a major factor contributing to a variation of the dilatational wave velocity with temperature. The shear wave velocity tends to decrease with ascending temperature. The role of unfrozen water in shear wave propagation is not as pronounced as it is on the dilatational wave. (See also W74-04346) (Knapp-USGS)
W74-04383

PRACTICAL EXTENSIONS TO A THEORY OF CONSOLIDATION FOR THAWING SOILS,
Alberta Univ., Edmonton.
J. F. Nixon, and N. R. Morgenstern.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 369-377, 1973. 9 fig, 9 ref.

Descriptors: *Permafrost, *Frozen soils, *Thawing, *Subsidence, *Consolidation, Ice, Soil mechanics, Pore pressure, Shear strength, Soil strength.

When frozen ground thaws, water is released and settlements develop as the water is squeezed from the ground. If the rate of generation of water exceeds the discharge capacity of the soil, excess pore pressures will develop, and these can lead to the failure of foundations and slopes. The one-dimensional theory of consolidation of thawing soils was extended to consider separately problems where the thaw depth is not simply proportional to the square root of time and problems where the change of void ratio of the soil bears a semilogarithmic relationship with the change in effective stress. Curves are presented for power law thaw depth-time relations. (See also W74-04346) (Knapp-USGS)
W74-04384

EXPERIMENTAL PRESSURE STUDIES ON FROST HEAVE MECHANISMS AND THE GROWTH-FUSION BEHAVIOR OF ICE,
Continental Oil Co., Ponca City, Okla.
F. J. Radd, and D. H. Oertle.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 377-384, 1973. 10 fig, 1 tab, 21 ref.

Descriptors: *Frost heaving, *Frozen soils, *Permafrost, *Crystal growth, *Freezing, Cryology, Ice, Laboratory tests, Pressure, Temperature, Porous media.

Experimental and theoretical studies were made of basic frost heave mechanisms. The P-T fusion curve for ice demonstrated non-Clapeyron behavior of pressure upon the solid in contact with its own unconfined liquid. This gave rise to pressure effects on ice that were about 13 times larger than the predicted Clapeyron equation. Ice-lens growth was demonstrated for presures up to 182.81 kg/sq cm. Ice-lens formation is a special form of crystal growth which is common to many liquid-solid transformations accomplished in insoluble fine-particle host systems. (See also W74-04346) (Knapp-USGS)
W74-04385

TRIAXIAL AND CREEP TESTS ON FROZEN OTTAWA SAND,
Cold Regions Research and Engineering Lab., Hanover, N.H.
F. H. Sayles.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 384-391, 1973. 12 Fig, 12 Ref.

Descriptors: *Permafrost, *Soil tests, *Sands, *Frozen soils, Creep, Stress, Strain, Shear strength, Strength, Soil strength.

Triaxial compression tests using a constant rate of applied strain and triaxial creep tests using a constant load were conducted on saturated frozen Ottawa sand and ice to gain a better understanding of the factors that influence the strength and deformation characteristics of frozen soils. The resistance of saturated frozen Ottawa sand in a confined stress condition can be considered as consisting of the cohesion of the ice matrix and the frictional resistance of the sand grains. These sources of strength are nearly independent of each other when the applied rate of strain is greater than 0.02. After the ice matrix has failed at a strain less than 0.01, the soil resistance becomes a function of the normal stress and the apparent angle of the internal friction of unfrozen sand, about 30 deg. For a given temperature the initial or cohesive strength of the frozen sand increases with the rate of applied strain. The rate of increase in the initial shear strength of saturated frozen Ottawa sand and polycrystalline columnar-grained ice decreases with increasing confining pressure. At the higher confining pressures used in this investigation, the initial shear strength is nearly independent of confining pressure at rates of applied strain greater than 0.02. The short-term (periods up to at least 100 h) creep strength of frozen Ottawa sand can be represented by Vyalov's strength equation. It is hypothesized that the long-term ultimate creep strength of saturated frozen sand with porosity of 37% or less is a function of the angle of internal friction of the sand, which could be determined through triaxial tests on unfrozen sand freely drained. (See also W74-04346) (Knapp-USGS)
W74-04386

SAMPLE DISTURBANCE AND THAW CONSOLIDATION OF A DEEP SAND PERMAFROST,
Woodward-Lundgren and Associates, Oakland, Calif.
W. S. Smith, K. Nair, and R. E. Smith.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 392-400, 1973. 3 fig, 8 tab, 5 ref.

Descriptors: *Frost heaving, *Thawing, *Permafrost, *Sampling, *Soil tests, Frozen soils, Soil properties, Freeze-thaw tests.
Identifiers: Sample disturbance.

To evaluate the influence of possible sample disturbance effects on the thaw-consolidation behavior of permafrost, artificially frozen specimens were fabricated in the laboratory where positive control of disturbance effects was possible. Uniaxial thaw-consolidation tests were performed on both recovered permafrost cores and artificially frozen specimens. Undisturbed normally consolidated frozen sand specimens have only very small thaw strains in contrast to the 3-5 percent thaw strains measured on normally consolidated disturbed specimens. However, the

undisturbed underconsolidated specimen showed that significant thaw strains would occur if the sand specimens were not normally consolidated in the frozen state. Disturbance effects were found to be very significant. Knowledge of sample disturbance effects should lead to more economical designs for most situations. (See also W74-04346) (Knapp-USGS)
W74-04387

VISCOELASTIC PROPERTIES OF FROZEN SOIL UNDER VIBRATORY LOADS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 8D.
W74-04388

PORE WATER AND HEAVING PRESSURES DEVELOPED IN PARTIALLY FROZEN SOILS,
Glasgow Univ. (Scotland).
H. B. Sutherland, and P. N. Gaskin.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 409-419, 1973. 6 fig, 10 tab, 19 ref.

Descriptors: *Pore pressure, *Frost heaving, *Frozen soils, *Permafrost, Soil water, Soil moisture, Freezing, Frozen ground, Thawing, Pore water.

Pressures associated with a growing ice lens in a partially frozen soil were studied both theoretically and experimentally. Equations expressing these pressures were derived, and some experimental results supporting them were obtained. The equations were derived initially for uniform spheres, and assumptions have to be made when they are applied to soils. The maximum heaving pressures and the maximum drops in pore water pressure were measured for four soils, and the measured values compared with those predicted. (See also W74-04346) (Knapp-USGS)
W74-04389

SHEAR STRENGTH AT A THAW INTERFACE,
Alberta Univ., Edmonton.
S. Thomson, and E. F. Lobacz.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 419-426, 1973. 9 fig, 4 tab, 11 ref.

Descriptors: *Soil strength, *Permafrost, *Thawing, Frozen soils, Frozen ground, Ice, Shear strength.

Laboratory shear tests were made on a remolded silty soil considered to be typical of those encountered in permafrost areas. Strength characteristics, assessed by means of conventional laboratory tests, were compared with strengths observed in direct shear tests in which a frozen-thawed interface coincided with the shear plane imposed by the direct shear apparatus. Information was obtained from undrained and drained triaxial tests on thawed samples. Strength loss is primarily due to moisture accumulation, including that from melting ice lenses, and to structural changes in the soil mass caused by the freezing process. (See also W74-04346) (Knapp-USGS)
W74-04390

GROUNDWATER INVESTIGATIONS IN PERMAFROST REGIONS OF NORTH AMERICA: A REVIEW,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 2F.
W74-04391

EFFECTS OF PERMAFROST ON STREAM FLOW CHARACTERISTICS IN THE DISCONTINUOUS PERMAFROST ZONE OF CENTRAL ALASKA,
Dubois and King, Inc., Randolph, Vt.
S. L. Dingman.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 447-453, 1973. 10 fig, 3 tab, 13 ref.

Descriptors: *Permafrost, *Surface-groundwater relationships, *Overland flow, *Alaska, *Arctic, Base flow, Hydrology, Frozen ground, Water table.

The presence of permafrost in the watershed of Glenn Creek, Alaska, is a major influence on the behavior of the stream, but this influence is rather indirect. Its most important roles are in supporting a high water table beneath the valley bottom area, so that overland flow derived from standing water in this area dominates the hydrograph rise and peak; restricting groundwater flow to the stream; and, providing an impermeable surface beneath the moss on the north facing slopes, over which water infiltrating the moss flows to the stream to dominate the hydrographic recession. (See also W74-04346) (Knapp-USGS)
W74-04392

GROUNDWATER PORE PRESSURES ADJACENT TO SUBARCTIC STREAMS,
Alaska Univ., College.
D. L. Kane, R. F. Carlson, and C. E. Bowers.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 453-458, 1973. 5 fig, 8 ref.

Descriptors: *Surface-groundwater relationships, *Permafrost, *Ice, *Pore pressure, *Arctic, Freezing, Frozen ground, Frozen soils.
Identifiers: Aufeis.

Two distinct flow conditions exist in the subarctic streams. During the ice-free periods open channel flow occurs, and, when ice conditions exist, closed conduit flow occurs. In the soil system, the downward freezing of the seasonal frost forms an impermeable barrier when the freezing front coincides with the unfrozen water. The combination of the aufeis and the saturated seasonal frost zone acts as the thin overlying confining layer. Movement of groundwater into the stream bank during the winter period results in a higher groundwater surface than exists during summer. By early June, this water is discharged into the stream when the open channel conditions again exist. If during the winter there is a net increase in bank storage along the entire stream, then the major source of streamflow is from subpermafrost groundwater. Movement of water down the stream channel decreases during the winter for two reasons. First, the quantity of water reaching the stream and adjacent aquifer from surface sources decreases during the winter because precipitation is being stored on the ground surface as snow. Second, a reduction in the cross-sectioned area of unfrozen water occurs in the channel as a result of downward freezing. This restriction of flow causes higher pressures in the stream that result in water flowing onto the surface. This water then freezes and is stored until spring breakup. (See also W74-04346) (Knapp-USGS)
W74-04393

RECHARGE OF A CENTRAL ALASKA LAKE BY SUBPERMAFROST GROUNDWATER,
Alaska Univ., College.
For primary bibliographic entry see Field 2F.
W74-04394

RISK OF UNCONTROLLED FLOW FROM WELLS THROUGH PERMAFROST,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2F.
W74-04395

A GROUNDWATER SUPPLY FOR AN OIL CAMP NEAR PRUDHOE BAY, ARCTIC ALASKA,
Metcalf and Eddy, Inc., Boston, Mass.
For primary bibliographic entry see Field 2F.
W74-04396

THE NATURE OF THE SEAWATER-FRESHWATER INTERFACE DURING BREAKUP IN THE COLVILLE RIVER DELTA, ALASKA,
Louisiana State Univ., Baton Rouge.
H. J. Walker.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 473-476, 1973. 3 fig, 1 tab, 12 ref. ONR Contract N00014-69-A-0211-0003.

Descriptors: *Permafrost, *Ice breakup, *Saline water-freshwater interfaces, *Saline water intrusion, *Arctic, *Alaska, Deltas, Ice jams, Rivers, Streams.
Identifiers: Colville River(Alaska).

Permafrost in combination with the seasonal freezing of the upper layers of all surface water results in the virtual cessation of flow in many arctic rivers and the replacement of the freshwater beneath the ice by seawater in their lower reaches. During the period of flooding in spring, seawater is replaced by floodwater that progresses seaward as a wedge beneath the sea ice. The freshwater-seawater interface that develops remains sharp as the floodwater advances. In 1971, the position and nature of the interface that developed off the Colville Delta in Alaska was established with a salinometer, and the volume of displaced seawater was calculated for the period of breakup flooding. Through the first 14 days of river flow, the discharge was 4640 million cu m. During the last 5 days of the flood season, discharge totaled 1060 million cu m. Thus, the total for the flood period was 5700 million cu m. This amount was 58% of the total discharge for 1971. (See also W74-04346) (Knapp-USGS)
W74-04397

MAPPING AND PREDICTING PERMAFROST IN NORTH AMERICA: A REVIEW, 1963-1973,
Geological Survey, Menlo Park, Calif.
O. J. Ferrians, Jr., and G. D. Hobson.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 479-498, 1973. 217 ref.

Descriptors: *Permafrost, *Mapping, Construction, *Reviews, Subsidence, Ice, Frozen ground, Frozen soils, Geophysics, Surveys, Hydrogeology, Soil moisture, Geomorphology, Remote sensing, Data collections, Seismic studies, Resistivity, *Bibliographies.

Methods of mapping and predicting permafrost are reviewed. The discussion is divided into two broad categories, the traditional methods and the geophysical methods. In practice the two categories overlap, and optimum results can be achieved only by utilizing aspects of both. To determine the best method or methods to use for a specific investigation, several factors must be considered--the most important of which are type and detail of information required, amount of area to be covered, complexity of the natural physical conditions in the area, and time and money available for the study. Of primary concern to engineering in permafrost areas are the character of the permafrost soils and the way in which a proposed structure (building, pipeline, and road) and these soils would interact. Wherever possible, areas that are underlain by ice-rich permafrost should be avoided for most engineering projects; otherwise structures must be designed to accommodate the ice-rich condition of the natural foundation material, and special construction techniques acceptable for permafrost areas must be used. These determinations are necessary in order to make intelligent land use assignments, to find and develop groundwater supplies, to plan and achieve effective waste-disposal systems, and to expeditiously explore for and develop mineral, coal, petroleum, and natural gas resources. (See also W74-04346) (Knapp-USGS)
W74-04398

IN SITU PHYSICOMECHANICAL PROPERTIES OF PERMAFROST USING GEOPHYSICAL TECHNIQUES,
Iron Ore Co. of Canada, Schefferville (Quebec).
O. P. Garg.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 508-516, 1973. 3 fig, 7 tab, 28 ref.

Descriptors: *Permafrost, *Frozen ground, *Borehole geophysics, Seismic studies, Electrical studies, Electrical resistance, Resistivity, Porosity, Data collections, *Canada.

Seismic refraction surveys using a multichannel seismograph and resistivity roundings using a dc portable unit were used to determine the depth of the permafrost table and the base of frozen ground. The depth of penetration achieved in delineating the bottom of permafrost depends on the resistivity contrasts between different layers and the structural and lithological complexities of the area. The resistivity penetration achieved in the Schefferville area of Quebec was the order of 80 m. (See also W74-04346) (Knapp-USGS)
W74-04399

ELECTROMAGNETIC PROBING OF PERMAFROST,
Cold Regions Research and Engineering Lab., Hanover, N.H.
P. Hoekstra, and D. McNeill.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 517-526, 1973. 10 fig, 1 tab, 16 ref.

Descriptors: *Permafrost, *Electrical studies, *Magnetic studies, *Geophysics, *Remote sensing, Surveys, Mapping, Data collections.
Identifiers: *Electromagnetic surveys.

In permafrost, three important objectives can be derived from ground resistivity: measurement of depth of permafrost; mapping of frozen sections in areas of discontinuous permafrost; and mapping of high-ice-content ground. The potential applications of ground and airborne low frequency electromagnetic sensors to map the electrical resistivity of ground are described. There are no apparent technological obstacles in applying two electromagnetic survey methods, the measurement of wave tilt and the measurement of coupling between two loop antennas, to permafrost problems. The theory is well developed, and equipment design has probably reached a satisfactory level. (See also W74-04346) (Knapp-USGS)
W74-04400

THE APPLICATION OF SHALLOW SEISMIC METHODS TO MAPPING OF FROZEN SURFICIAL MATERIALS,
Geological Survey of Canada, Ottawa (Ontario).
J. A. M. Hunter.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 527-534, 1973. 10 fig, 8 ref.

Descriptors: *Permafrost, *Seismic studies, *Mapping, Geophysics, Data collections, Frozen soils, Frozen ground, *Canada.

Shallow refraction seismic methods were successfully applied to permafrost studies. Conventional instrumentaion used in shallow prospecting can be applied to permafrost in summer or winter for a rapid, economical survey. Refraction spreads are generally much longer than those in permafrost-free areas to obtain the necessary depth information. The refraction method may be used to map the occurrence of permafrost in the discontinuous zone under summertime conditions where a thawed active layer is present, because about a meter of seasonal frost at surface in winter restricts the use of refraction methods. Structure within permafrost can be mapped with the refraction technique in conjunction with borehole control for seismic velocities. Massive ice lenses have been delineated at depth. Marine refraction seismic methods may be used to map the occurrence of permafrost under the sea bottom. Anomalous attenuation of refracted waves was observed in regions of thin permafrost. This phenomenon may be associated with refraction of seismic waves in a thin high-speed surface layer. (See also W74-04346) (Knapp-USGS)
W74-04401

INVESTIGATION OF SAMPLING PERENNIALLY FROZEN ALLUVIAL GRAVEL BY CORE DRILLING,
Cold Regions Research and Engineering Lab., Hanover, N.H.
G. R. Lange.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 535-541, 1973. 2 fig, 1 tab, 5 ref.

Descriptors: *Permafrost, *Core drilling, *Drilling fluids, Sampling, Frozen ground, Frozen soils, Gravels, Alluvium.

Excellent cores of frozen gravel and frozen, fractured, and weathered rock at near freezing ground temperatures may be taken by circulating a liquid drilling fluid chilled to temperatures just below the ground temperature, even in summer weather, if the material is well bonded by ice. Compressed air is not feasible for core drilling untilthe ambient air temperature reaches -4 deg C or cooler. Excellent quality cores as small as 70 mm were consistently taken. Borehole wall stabilization was satisfactorily achieved with the chilled liquids, except where the walls were not well bonded by ice. (See also W74-04346) (Knapp-USGS)
W74-04402

POTENTIAL USE OF AIRBORNE DUAL-CHANNEL INFRARED SCANNING TO DETECT MASSIVE ICE IN PERMAFROST,
Development and Resources Transportation Co., Silver Spring, Md.
For primary bibliographic entry see Field 7B.
W74-04403

ENGINEERING DESIGN AND CONSTRUCTION IN PERMAFROST REGIONS: A REVIEW,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 8D.
W74-04404

WATER SUPPLY AND WASTE DISPOSAL CONCEPTS APPLICABLE IN PERMAFROST REGIONS,
Alaska State Dept. of Environmental Conservation, Fairbanks.
For primary bibliographic entry see Field 5D.
W74-04405

SOME PASSIVE METHODS OF CONTROLLING GEOCRYOLOGICAL CONDITIONS IN ROADWAY CONSTRUCTION,
Cold Regions Research and Engineering Lab., Hanover, N.H.
R. L. Berg, and G. W. Aitken.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 581-586, 1973. 5 fig, 2 tab, 10 ref.

Descriptors: *Permafrost, *Subsidence, *Frost heaving, *Road construction, Arctic, *Alaska, Thawing, Freezing, Insulation, Cryology.

The most effective technique for controlling permafrost degradation under roads was that of painting the pavement surface white. Performance of a baled peat heat sink was not satisfactory and this approach should probably not be considered in an area having a thermal regime similar to that at Fairbanks. Two different heat transfer computational techniques are applicable in evaluating thermal designs in permafrost areas. The finite difference technique should have more widespread application because of the flexibility it provides with regard to specification of boundary and initial conditions. (See also W74-04346) (Knapp-USGS)
W74-04406

ENVIRONMENTAL CONSIDERATIONS FOR THE UTILIZATION OF PERMAFROST TERRAIN,
Cold Regions Research and Engineering Lab., Hanover, N.H.
J. Brown.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 587-590, 1973. 1 fig, 21 ref.

Descriptors: *Permafrost, *Subsidence, *Erosion, *Environmental effects, Highway effects, Arctic, Vegetation effects, Frail lands.

Current utilization of the permafrost landscape is still relatively low as a result of its vastness, remoteness and inaccessibility, and low population usages. However, where population and industrial centers do exist, the solutions of problems caused by the presence and potential degradation of permafrost are expensive. Frequently, symptoms of permafrost degradation occur regardless of the care exercised to avoid them. These changes are characteristically generated at the ground surface as the energy exhange processes are modified; however, these surface effects are transferred into the permafrost. Unsightly vehicle impressions across the uninhabited tundra may be acceptable to some, but an accelerated and headward eroding channel resulting from a poorly designed facility, road, or entrenched vehicle trail is no longer tolerated. The definition of that fine line between permissible and nonpermissible use of the permafrost terrain, both in time and space, should prove to be an excellent point of discussion and cooperation between Northern American, Soviet, and other researchers and planners. (See also W74-04346) (Knapp-USGS)
W74-04407

SETTLEMENT ASSOCIATED WITH THE THAWING OF PERMAFROST,
Cold Regions Research and Engineering Lab., Hanover, N.H.
F. E. Crory.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 599-607, 1973. 10 fig, 1 tab, 11 ref, append.

Descriptors: *Subsidence, *Thawing, *Permafrost, *Moisture content, Porosity, Frost heaving, Strain, Freezing, Frozen ground, Frozen soils, *Arctic, Soil mechanics.

A direct, simple and accurate method is given for predicting the settlements associated with the thawing of permafrost, using the water content and dry unit weight of undisturbed samples of the frozen ground. The relationships between water content and dry unit weight of saturated frozen and thawed soils are discussed. When the soil is saturated, the potential settlement on thawing can be easily assessed, using only the water content of disturbed or undisturbed samples of the frozen soil. A settlement prediction method can be readily integrated with thermal prediction methods in determining the rate of settlement and strength of thawing soils with respect to time. (See also W74-04346) (Knapp-USGS)
W74-04408

CONTROL OF PERMAFROST DEGRADATION BENEATH A ROADWAY BY SUBGRADE INSULATION,
Alaska State Dept. of Highways, College.
For primary bibliographic entry see Field 4C.
W74-04409

THERMAL REGIME IN AN ARCTIC EARTHFILL DAM,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 8D.
W74-04410

CONTROL OF CULVERT ICING,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 4C.
W74-04411

ANALYSIS OF THE PROPOSED LITTLE CHENA RIVER, EARTHFILLED NONRETENTION DAM, FAIRBANKS, ALASKA,
Corps of Engineers, Anchorage, Alaska.
For primary bibliographic entry see Field 8D.
W74-04412

SOME EFFECTS OF SURFACE DISTURBANCE ON THE PERMAFROST ACTIVE LAYER AT INUVIK, N.W.T., CANADA,
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 4C.
W74-04413

CORPS OF ENGINEERS TECHNOLOGY RELATED TO DESIGN OF PAVEMENTS IN AREAS OF PERMAFROST,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 4C.
W74-04414

PERMAFROST PROTECTION FOR PIPELINES,
Esso Production Research Co., Houston, Tex.
H. O. Jahns, T. W. Miller, L. D. Power, W. P. Rickey, and T. P. Taylor.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 673-684, 1973. 13 fig, 3 tab, 23 ref.

Descriptors: *Permafrost, *Oil fields, *Pipelines, *Thawing, Insulation, Frozen ground, Frozen soils, Arctic, *Alaska.
Identifiers: *Heated pipelines.

Pipeline operations in permafrost regions are faced with unique problems that arise from disturbances of the thermal regime in the ground. The thawing of ice-rich soil can result in a loss of adequate pipeline support. The conventional buried pipeline mode may be inadequate in these soils, particularly if the pipeline is to be operated at temperatures above the freezing point. Insulation placed around a warm buried pipeline is an efficient means of reducing heat transfer to the ground and, consequently reducing the rate of thaw. In cold permafrost, insulation alone can prevent the formation of a permanent thaw plug around the pipeline. Insulation and other passive protection systems for a warm buried pipeline tend to become very bulky in warm permafrost if no thawing is to be allowed below the line. Mechanical refrigeration can provide complete permafrost protection below an insulated buried pipeline under all climatic conditions of interest. Refrigeration rates required in such a system are not excessive. Thermal piles equipped with natural convection devices for heat removal during winter can be designed to prevent permafrost degradation around pile supports for an elevated pipeline. Both single-phase and two-phase closed systems are available for this purpose. In large-diameter piles, an open air convection system can also be used. Temperatures at the pile-soil interface may rise to near the freezing point during the summer when the thermal pile is inactive. White paint and insulation can offer permafrost protection for gravel berms. (See also W74-04346) (Knapp-USGS)
W74-04415

PERMAFROST-RELATED ENGINEERING GEOLOGY PROBLEMS POSED BY THE TRANS-ALASKA PIPELINE,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 8D.
W74-04416

LONG-TERM EFFECTS OF VEGETATIVE COVER ON PERMAFROST STABILITY IN AN AREA OF DISCONTINUOUS PERMAFROST,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 4C.
W74-04417

STABILITY OF AN UNDERGROUND ROOM IN FROZEN GRAVEL,
Bureau of Mines, Spokane, Wash.
H. C. Pettibone.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 699-706, 1973. 6 fig, 1 tab, 7 ref.

Descriptors: *Mining, *Permafrost, *Gravels, *Frozen ground, *Alaska, Thawing, Subsidence, Freezing, Soil mechanics.

The economic and technological practicability of mining gold from buried frozen gravel placers in Alaska was investigated. In Fairbanks, Alaska, the normal maximum temperatures are below freezing from November through March and, therefore, above freezing during April through October. For 5 months of the year (November through March), an underground room in permafrost gravel at a depth of 15-30 m, 3 m high by 9 m wide by any length (21.3-m length in test), remained open without artificial support. Most rock falls occur within a few days after the opening is excavated, and occasional slabs develop, particularly around silt lenses. Rock falls can be minimized by excavating a smooth roof such as that produced with a continuous miner or with smooth-wall blasting. A possible method of portal support for operation during the winter months only (November through March) would be continuous support (such as corrugated metal pipe through the active layer), then a sealing off of the portal from April through October. This system would rely on the natural permafrost temperature for mine support during the summer months assuming no work during this period, and supercooling the mine during the winter months with natural cold air. For year-round operations, the most satisfactory method of ground support would be to keep the ground frozen by maintaining the air temperature in all working areas at -3.9 deg C or lower. Circulation of such cold, dry air would aggravate the sublimation problem and increase the frequency of gravel falling from the roof. To attempt operations during the warm months without refrigeration (using warm air ventilation), continuous support throughout the working and access areas is imperative. (See also W74-04346) (Knapp-USGS)
W74-04418

A SEWAGE-TREATMENT CONCEPT FOR PERMAFROST AREAS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 5D.
W74-04419

ENCOUNTERING MASSIVE GROUND ICE DURING ROAD CONSTRUCTION IN CENTRAL ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 4C.
W74-04420

THE USE OF POLYURETHANE FOAM PLASTICS IN THE CONSTRUCTION OF EXPEDIENT ROADS ON PERMAFROST IN CENTRAL ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 8G.
W74-04421

EFFECTS OF GROUND-ICE VARIABILITY AND RESULTING THAW SETTLEMENTS ON BURIED WARM-OIL PIPELINES,
Mackenzie Valley Pipeline Research Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 4C.
W74-04422

PERFORMANCE OF A WARM-OIL PIPELINE BURIED IN PERMAFROST,
Mackenzie Valley Pipeline Research Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 8D.
W74-04423

LIME DISINFECTION OF SEWAGE BACTERIA AT LOW TEMPERATURE.
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W74-04548

RADIO DEPTH-SOUNDING ON MEIGHEN AND BARNES ICE CAPS, ARCTIC CANADA,
Department of the Environment, Ottawa, (Ontario). Inland Waters Directorate.
S. J. Jones.
Scientific Series No 25, 1972. 13 p, 9 fig, 4 tab, 18 ref.

Descriptors: *Sounding, *Glaciers, *Canada, *Arctic, *Radar, Glaciology, Ice, Depth.
Identifiers: Barnes Ice Cap, Meighen Ice Cap.

Depth measurements through Meighen Ice Cap, Meighen Island, and Barnes Ice Cap, Baffin Island, were obtained by using a 35 MHz radio echo sounder. By comparison with a known borehole depth on Meighen, the velocity of the radio waves in the ice was calculated to be 178 plus or minus 2 m per microsec. The minimum depth that could be sounded was 90 m. On Barnes Ice Cap, the velocity was measured by a wide angle reflection technique as 168 plus or minus 2 m per microsec, and continuous photographic recording of the depth was obtained. Estimates of absorption in the ice from attenuator settings of the echo sounder were significantly greater than previously published values. (Knapp-USGS)
W74-04571

EFFECTS OF STRATIGRAPHIC LAYERS ON WATER FLOW THROUGH SNOW,
Cold Region Research and Engineering Lab., Hanover, N.H.
S. C. Colbeck.
Research Report 311, September 1973. 15 p, 5 fig, 21 ref.

Descriptors: *Snowpacks, *Snowmelt, *Unsaturated flow, Saturated flow, Porous media, Ice, Snow, *Melt water, Drainage, Percolation.

The flow of water through layered snowpacks is discussed. The difference in permeability of layers required to cause large flow diversions is quite small. The effect of slope is large even at small angles. Large variations in the properties of layers in snowpacks occur in time and space. The propagation of values of volume flux (or effective-water saturation) through a snowpack can be predicted for an unsaturated snowpack of any layered composition. The propagation of a known waveform throughout the snowpack can be predicted by constructing as many of the characteristics as necessary (by assuming that no shock front occurs) and

then using the conservation of mass to locate the position of the shock front. When accumulation of water above a less permeable layer produces a perched water table, lateral flow along the layer is likely. In this case, flow at the local scale is considered two-dimensional. In view of the rapid deterioration of ice layers during intense melting, the treatment of these layers as porous media is reasonable. Direct infiltration and lateral flow both increase with the thickness of the water layer, and the relative importance of the lateral mode of flow increases with the thickness of the water layer. For typical values of these parameters, the ratio of flow along the layer to flow through the layer increases by an order of magnitude when the angle of slope increases from 0 deg to 10 deg. (Knapp-USGS)
W74-04572

AN ANALYTICAL STUDY OF A COILED-PIPE HEAT SINK,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 8B.
W74-04589

QUICKCLAYS AS PRODUCTS OF GLACIAL ACTION: A NEW APPROACH TO THEIR NATURE, GEOLOGY, DISTRIBUTION AND GEOTECHNICAL PROPERTIES,
Leeds Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W74-04590

THE WATER BALANCE IN ARCTIC AND SUBARCTIC REGIONS--ANNOTATED BIBLIOGRAPHY AND PRELIMINARY ASSESSMENT,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. L. Dingman.
Special Report 187, June 1973. 131 p, 2 fig, 294 ref. Army Project 4A062112A89420.

Descriptors: *Arctic, *Water balance, *Bibliographies, Abstracts, *Reviews, Hydrologic cycle, Glaciers, Glaciation, Evapotranspiration, Groundwater, Hydrogeology, Precipitation(Atmospheric), Runoff, Streamflow.
Identifiers: *Subarctic regions.

Definitions and boundaries of the arctic and subarctic are reviewed; a map showing these boundaries and annotations of a number of publications dealing with this problem are also presented. A bibliography includes several hundred reports that directly discuss elements of the water balance in arctic and subarctic regions. These annotations are grouped by geographic area: the Northern Hemisphere, Europe, the U.S.S.R., Alaska, Canada, and Greenland and Iceland. For each area, annotations are presented according to water-balance elements: precipitation, evapotranspiration, runoff, streamflow, groundwater contributions to runoff, and changes in glacial storage. A subsequent section gives annotations of articles on the water balance of the Arctic Ocean. This is followed by a brief assessment of the state of knowledge on the water-balance elements in each geographic region. This bibliography is intended to be complete for the period 1950-1971 (some earlier articles are included), especially for articles published in English. A large number of items from the Russian and European literature are included, but the bibliography is probably less complete for these. A total of 688 annotations is included; many articles are annotated in more than one section, as they include information on more than one water-balance element or more than one geographic area. (Knapp-USGS)
W74-04601

SUBGLACIAL DEVELOPMENT OF CHLORELLA IN BAIKAL, (IN RUSSIAN),
Irkutskii Gosudarstvennyi Universitet (USSR).
For primary bibliographic entry see Field 2H.
W74-04647

STRIATED GROUND, A TYPE OF PATTERNED GROUND IN THE PERIGLACIAL AREA OF THE VENEZUELAN ANDES, (IN SPANISH),
Instituto Venezolano de Investigaciones Cientificas, Caracas.
For primary bibliographic entry see Field 2G.
W74-04651

POLLUTED SNOW IN SOUTHERN NORWAY DURING THE WINTERS 1968-1971,
Oslo Univ. (Norway). Zoological Lab.
For primary bibliographic entry see Field 5B.
W74-04652

ICE ENGINEERING--SUMMARY OF ELASTIC PROPERTIES RESEARCH AND INTRODUCTION TO VISCOELASTIC AND NONLINEAR ANALYSIS OF SALINE ICE,
Naval Civil Engineering Lab., Port Hueneme, Calif.
M. G. Katona, and K. D. Vaudrey.
Available from NTIS, Springfield, Va. 22151 AD-768 279; Price $3.50 printed copy; $1.45 microfiche. Technical Report R797, August 1973. 71 p, 38 fig, 1 tab, 21 ref, append.

Descriptors: *Sea ice, *Elastic theory, Elastic deformation, Cryology, Ice, *Ice loads, Strength of materials, Structural design, Elasticity(Mechanical).
Identifiers: *Saline ice.

Techniques used to analyze the behavior of sea ice are reviewed. Studies on elastic behavior are reviewed with emphasis placed on plate analysis. Classical plate theory and the finite element method are compared in analyzing ice plates, with special attention given to sea-ice airfields. Because elastic analysis is not totally representative of actual ice behavior, a general formulation is presented which gives the assumptions and procedures for both viscoelastic and nonlinear domains of sea-ice behavior. A laboratory program was initiated to determine material properties that are necessary to extend sea-ice analysis into the inelastic range. (Knapp-USGS)
W74-04793

EFFECTS OF SALT CONCENTRATION CHANGES DURING FREEZING ON THE UNFROZEN WATER CONTENT OF POROUS MATERIALS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
A. Banin, and D. M. Anderson.
Water Resources Research, Vol 10, No 1, p 124-128, February 1974. 4 fig, 2 tab, 12 ref.

Descriptors: *Freezing, *Saline water, *Porous media, *Frozen soils, Frozen ground, Permafrost, Frost, Soil water, Aqueous solutions, Equations, Salts.

By combining equations for salt concentration by water removal from porous bodies with those for freezing point depression in normal solutions, equations were developed for calculating freezing point depression shifts due to the gradual removal of water upon freezing in porous bodies. The same equations can be used for the calculation of shifts in the osmotic potential of the water in drying porous bodies by using a simple conversion factor. Graphs relate the remaining water content to the freezing point shift for various initial soluble salt contents. Good agreement was found between the measured freezing point depression in a silty clay soil treated with three concentrations of sodium chloride and with dimethyl sulfoxide at various contents of unfrozen water and the calculated values. (Knapp-USGS)
W74-04802

WATER FLOW THROUGH SNOW OVERLYING AN IMPERMEABLE BOUNDARY,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. C. Colbeck.
Water Resources Research, Vol 10, No 1, p 119-123, February 1974. 3 fig, 14 ref.

Descriptors: *Snowpacks, *Melt water, *Percolation, *Unsaturated flow, Infiltration, Water yield, Temperature, Snowmelt, Glaciohydrology, Melting, Mathematical models.

A two-layer model describes water flow over an impermeable boundary. The model consists of vertical flow through an unsaturated layer and flow along a boundary in a saturated layer. The governing equations are solved for the nonsteady case, where the gradient of the thickness of the saturated layer is small compared with the slope of the impermeable boundary. In most cases the discharge from shallow snowpacks will preserve the diurnal cycles of input at the surface, although for deep snowpacks (such as temperate glacier firn) the diurnal cycle is smoothed and only long-term responses are expected. The flow of a diurnal meltwater wave through a small (2.10 m deep by 100 m long) snowpack was calculated as an example. The case of steady flow is also described. (Knapp-USGS)
W74-04803

2D. Evaporation and Transpiration

SOLAR ENERGY FOR THE CONCENTRATION OF PULP MILL EFFLUENTS,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W74-04544

MODELING OF TURBULENT TRANSPORT IN THE SURFACE LAYER,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
G. L. Smith.
Available from NTIS Springfield, Va. 22151 NASA TN D-7306, copy price, $3.00 domestic, $5.50 foreign; $1.45 microfiche. Technical Note D-7306, December 1973. 33 p, 1 fig, 15 ref.

Descriptors: *Turbulence, *Mixing, *Winds, *Evapotranspiration, Mass transfer, Convection, Dispersion, Turbulent flow, Model studies.

Atmospheric turbulence is sufficiently important to warrant computation of a set of general constants. Donaldson's equations are simplified for the large Reynolds numbers characteristic of atmospheric turbulence. Also, the turbulent Prandtl number is introduced into the model. The boundary conditions suitable for a rough surface (e.g., grass, forest, or city) are considered, and heuristic arguments are given for a set, which is selected. The equations are then solved for a neutrally stable atmosphere (no vertical heat flux), thereby resulting in the familiar logarithmic wind profile. This serves three purposes: The suitability of the governing equations is verified; the suitability of the boundary conditions is verified; and two constants in the method are evaluated for atmospheric application. Next the case of stable stratification above the influence of the surface roughness is treated. From this study comes a mixing length appropriate to the stable layer. This length can be used to determine the point above which the mixing length becomes constant. Finally, the free-convection or unstable case, in which turbulence is thermally produced, is considered. (Knapp-USGS)
W74-04795

2E. Streamflow and Runoff

MATHEMATICAL MODELING OF STREAM STORAGE POTENTIAL,
Arkansas Univ., Fayetteville. Water Resources Research Center.
H. M. Jeffus.
Available from National Technical Information Service as PB-228 021 $3.75 in paper copy, $1.45 in microfiche. Publication No 17, December 1973. 59 p, 12 fig, 27 ref, 2 append. OWRR B-015-ARK(1).

Descriptors: Streamflow, Hydrology, Reservoirs, Water supply, Equations, *Mathematical models, *Storage requirements, Management, Resources development, Engineering, planning, Runoff, *Arkansas, *Hydrologic data.
Identifiers: *Moran's model(Dams).

Streamflow data from unregulated streams in Arkansas were processed through Moran's Model for a dam. The process involved calculating a cumulative gamma distribution for each stream as the streamflow values were incremented in units of 0.1 cubic feet per second per square mile of drainage area. This gamma distribution was then used as input for Moran's Model. The output from Moran's Model includes the probability of the reservoir having zero contents as the size of the reservoir is decreased. The logarithm of the probability of zero contents, ln Po, versus reservoir size, K, is a straight line of the form ln Po = -n-sK. The constants in the equation, n and s, are functions of the logarithm of the draft when the draft is expressed as a percentage of mean annual flow. The equations for ln Po versus K were determined for each stream studied. In addition, a general equation for all streams was determined.
W74-04305

MULTI-DIMENSIONAL ASPECTS OF EDDY DIFFUSION DETERMINED BY DYE DIFFUSION EXPERIMENTS IN COASTAL WATERS (SUMMARY),
Loyola Univ., Los Angeles, Calif.
For primary bibliographic entry see Field 2L.
W74-04322

HARMONIC GENERATION OF SHALLOW WATER WAVES OVER TOPOGRAPHY,
Florida State Univ., Tallahassee. Geophysical Fluid Dynamics Inst.
J. Lau, and A. Barcilon.
Journal of Physical Oceanography, Vol 2, No 4 p 405-410, October 1972. 2 fig, 10 ref.

Descriptors: *Shallow water, *Waves(Water), Topography, *Coasts, *Energy transfer, Reflection.
Identifiers: Nearshore.

The reflection and nonlinear interaction between the first and second harmonics of a two-dimensional Boussinesq wavetrain was investigated. Effects of topography are included, the depth departing from a constant in a finite region. It is found that topography can speed up or retard energy transfer between first and second harmonics. The reflection coefficient in the present context is significantly different from the one obtained by using linear theory. This is partly due to partitioning of energy between harmonics. Two examples were studied and the results show that for long-scale topography the rate of harmonic generation depends upon the local depth which affects the detuning and thus the energy transfer between the first and second harmonics. When wave-scale and subwave-scale variations are found, reflection plays an important part. There is a competition for the partitioning of energy between reflection and harmonic generation. (Sinha-OEIS)
W74-04323

PHYSICAL AND DYNAMICAL SCALES FOR GENERATION OF WIND WAVES,
Hydronautics, Inc., Laurel, Md.
J. Wu.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 98, No WW2, Proceedings paper 8879, p 163-175, May 1972. 5 fig, 28 ref, 2 append.

Descriptors: *Wind velocity, Waves(Water), *Ocean waves, *Energy transfer, *Fetch.
Identifiers: *Wind waves, *Wave generation, Airflow patterns, Air-sea interaction.

An analysis is given of relevant physical scales on which coupling takes place between long and short waves, and dynamic scaled for coupling of wind and waves, in the generation of wind waves. Based on these scales and on a separation criterion, it is argued that the airflow separates from dominant waves in the laboratory and from ripples superimposed on dominant waves in the field. This difference may account for the discrepancy between the laboratory-determined growth rate and that observed in the field. Finally, some consideration is given to observational evidence and critical scales relating to the nonlinear mechanism for wave generation. Also, a nonlinear mechanism is speculated to furnish a key link for generation of sea waves-wind generating ripples (surface roughness) due to a sequence of actions of resonance, laminar and sheltering models, and a nonlinear mechanism transferring energy from ripples to dominant waves. (Sinha-OEIS)
W74-04330

THERMAL DISTURBANCE DUE TO CHANNEL SHIFTING, MACKENZIE DELTA, N.W.T., CANADA,
Carleton Univ., Ottawa (Ontario).
For primary bibliographic entry see Field 2C.
W74-04351

EFFECTS OF PERMAFROST ON STREAM FLOW CHARACTERISTICS IN THE DISCONTINUOUS PERMAFROST ZONE OF CENTRAL ALASKA,
Dubois and King, Inc., Randolph, Vt.
For primary bibliographic entry see Field 2C.
W74-04392

THE NATURE OF THE SEAWATER-FRESHWATER INTERFACE DURING BREAKUP IN THE COLVILLE RIVER DELTA, ALASKA,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 2C.
W74-04397

HYBRIDIZATION BETWEEN THE DARTERS PERCINA CRASSA ROANOKA AND PERCINA OXYRHYNCHA (PERCIDAE, ETHEOSTOMATINI), WITH COMMENTS ON THE DISTRIBUTION OF PERCINA CRASSA ROANOKA IN NEW RIVER,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
C. H. Hocutt, and P. S. Hambrick.
American Midland Naturalist, Vol 90, No 2, p 397-405, October 1973. 3 fig, 2 tab, 26 ref.

Descriptors: *Fish taxonomy, *Darters, *Virginia, Fish, Freshwater fish, Systematics, Classification, Aquatic habitats.
Identifiers: *New River(Va), Hybrids(Fish).

A new Percina hybrid, Percina crassa roanoka X Percina oxyrhyncha, is described from the upper Kanawha (New) River system in Virginia. Meristic characters of the hybrid are either intermediate or closer to P. c. roanoka; morphometrics indicate intermediacy or similarity to P. oxyrhyncha. P. c. roanoka, originally described from the Roanoke River drainage, is introduced to the New River system and has characteristics of an opportunistic species. (Knapp-USGS)
W74-04472

THE ELEVATION, SLOPE, AND CURVATURE SPECTRA OF A WIND ROUGHENED SEA SURFACE,
New York Univ., Bronx. School of Engineering and Science.
W. J. Pierson, Jr., and R. A. Stacy.
Available from NTIS, Springfield, Va 22151 NASA CR-2247 Price $4.50 printed copy (domestic) $7.00 (foreign); $1.45 microfiche. National Aeronautics and Space Administration Contractor Report CR-2247, December 1973. 126 p, 30 fig, 5 tab, 63 ref. NASA Contract NASI-10090.

Descriptors: *Waves(Water), *Winds, *Ocean waves, Frequency analysis, Turbulence.
Identifiers: *Roughness(Sea-surface).

The elevation, slope and curvature spectra of a wind roughened sea surface were deduced from an analysis of a wide variety of reports and data sources and verified to a large extent by means of both these sources and other independent sources. The spectra are defined as a function of wave number and depend on the friction velocity. There are five wave number ranges of definition, called the gravity wave-gravity equilibrium range, the isotropic turbulence range, the connecting range due to Leykin and Rosenberg, the capillary range, and the viscous cutoff range. The higher wave number ranges are strongly wind speed dependent, and there is no equilibrium (or saturated) capillary range, at least for winds up to 30 meters/sec. Some properties of the angular variation of the spectra were also found. For high wave numbers, especially in the capillary range, the results are shown to be consistent with the Rayleigh-Rice backscattering theory (Bragg scattering), and certain properties of the angular variation are deduced from backscatter measurements. (Knapp-USGS)
W74-04476

A LABORATORY INVESTIGATION OF FREE SURFACE FLOWS OVER WAVY BEDS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8B.
W74-04477

HYDRAULIC PERFORMANCE OF BRIDGES--EXCAVATIONS AT BRIDGES,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 8B.
W74-04482

EFFECTS OF URBANIZATION ON FLOODS IN THE DALLAS, TEXAS, METROPOLITAN AREA,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4C.
W74-04483

SPECIAL ANALYSIS OF SHORT INERTIAL-INTERNAL WAVE RECORDS,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
C. J. Frankignoul, and R. F. Henry.
Manuscript Report Series, No 34, 1973. 26 p, 6 fig, 5 ref.

Descriptors: *Waves(Water), *Time series analysis, Frequency analysis, Simulation analysis, Fourier analysis, Statistics, Statistical methods, Ocean waves.

Various methods of trend removal in time series of ocean waves are compared, by means of experiments on both simulated and observed data, to establish which is the most effective in minimizing leakage between frequency bands during spectral analysis of short segments of a record with a dominant inertial frequency contribution. Removal of

the linear trend defined by joining the end-points of each segment gives substantial improvement. (Knapp-USGS)
W74-04489

SURFACE-WATER AVAILABILITY, LAUDERDALE COUNTY, ALABAMA,
Geological Survey, University, Ala.
D. M. O'Rear, A. L. Knight, J. R. Harkins, and J. R. Willmon.
Alabama Geological Survey Map 107, 1972. 11 p, 5 fig, 1 map, 1 tab, 16 ref.

Descriptors: Water resources, *Surface waters, *Streamflow, *Runoff, *Alabama, Water yield, Flow rates, Average flow, Low flow, Hydrologic data, Water temperature, Water quality, Chemical analysis, *Maps, Hydrographs, Flow duration, Low-flow frequency, Hydrologic budget.
Identifiers: Lauderdale County(Ala).

The Tennessee River, the southern boundary of Lauderdale County, Alabama, has an average flow of 32,800 mgd and Elk River, the southeastern boundary, has an average flow of 2,470 mgd at its mouth. Other streams include Bluewater, Shoal, and Cypress Creeks in the central part of the county with average flows of 180,570, and 265 mgd, respectively, at their mouths; and Second Creek in the western part has an average flow of 90 mgd at its mouth. The statistical index used to describe low flows is the 7-day low flow (7-day Q2). The 7-day Q2 is defined as the lowest average rate of flow for 7 consecutive days occurring at an average interval of 2 years. The Tennessee River has a 7-day Q2 greater than 1,000 mgd; however, the flow is subject to regulation by reservoirs. Elk River has a 7-day Q2 of 165 mg, and Shoal Creek has a 7-day Q2 of 114 mgd. Other streams in the county have 7-day Q2 values that range from 42 to less than 2 mgd. Surface-water data for Lauderdale County are presented in a manner that provides a visual appraisal of surface-water availability which can be compared with other counties in the State. An average-flow and low-flow map is included. Water from the Tennessee River and other streams in the county is of suitable chemical quality for most uses. The water temperature ranges from about 4C in January to 28C in August. (Woodard-USGS)
W74-04494

SPRING RUNOFF FROM HILLSLOPES, SMALL WATERSHEDS, AND RIVER BASINS (VESENNIY STOK SO SKLONOV, MALYKH VODOSBOROV, RECHNYKH BASSEYNOV),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
N. I. Koronkevich, and Z. A. Krylova.
Vodnyye Resursy, No 3, p 93-108, 1973. 5 fig, 1 tab, 48 ref.

Descriptors: *Overland flow, *Runoff, *Slopes, *Small watersheds, *River basins, Land management, Spring, Maps.
Identifiers: *USSR.

Procedures are presented for determining overland flow from data of water-balance and runoff stations. Average long-term overland flow in forested steppe and steppe zones and in the southern part of the forested zone of the USSR is calculated on the basis of runoff from a forested area, a fall-plowed field, and from fields left unplowed since fall. Relations are established between overland flow and streamflow and between overland flow and runoff from small watersheds. The relations obtained can be used to prepare a small-scale map of overland flow in spring from fields in the Don River basin. (Josefson-USGS)
W74-04577

WAVE ACTION AND BREAKWATER DESIGN, HAMLIN BEACH HARBOR, NEW YORK,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W74-04588

PALEOHYDROLOGY AND SEDIMENTOLOGY OF LAKE MISSOULA FLOODING IN EASTERN WASHINGTON,
Texas Univ., Austin. Dept. of Geological Sciences.
V. R. Baker.
Geological Society of America Special Paper 144, 1973. 79 p, 55 fig, 1 plate, 2 tab, 94 ref, 2 append.

Descriptors: *Paleohydrology, *Floods, *Discharge(Water), *Sedimentology, Sedimentary structures, *Washington, Ripple marks, Sand bars, Sediment transport, *Pleistocene epoch, Columbia River, Stage-discharge raltions, Montana.
Identifiers: Missoula floods(Wash), Columbia Plateau(Wash), Lake Missoula(Mont).

The Missoula floods of late Pleistocene age probably involved the largest discharges of freshwater that have been documented in the geologic record. The Columbia Plateau of eastern Washington contains evidence for flooding in pre-Bull Lake, Bull Lake, and early Pinedale time. The early Pinedale flood was the most extensive and left considerable high-water mark evidence in the form of (1) eroded channel margins, (2) highest flood gravel, (3) minor divide crossings, and (4) ice-rafted erratics. The water-surface gradients and channel geometry provide input data for the slope area and contracted-opening hydraulic calculation procedures. Maximum discharges through scabland channels ranged from 752 million cubic feet per second in the Rathdrum Prairie to 17.5 million cubic feet per second in Rocky Coulee. The flood's duration was amazingly short. Even with gradually waning flows, the early Pinedale flood probably lasted only a week or two. Sixty trains of giant current ripples are recognized in the study area. Mean ripple chords vary from 60 to 425 feet. Mean ripple heights vary from 1.5 to 22 feet. (Knapp-USGS)
W74-04599

WAVES AT CAMP PENDLETON, CALIFORNIA,
California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics.
W. H. Powers, Jr., L. Draper, and P. M. Briggs.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 1, p 1-8, 1969. 5 fig, 7 ref.

Descriptors: *California, *Waves(Water), *Coasts, *Shallow water, Measurement, *Ocean waves, Seasonal.
Identifiers: Camp Pendleton(CA), *Nearshore processes.

Waves were recorded for nine years at Camp Pendleton, California and the results of an analysis of records over two years are presented graphically. There appeared to be no consistent seasonal distribution of wave heights or periods, so the reults are presented on a yearly basis. The significant wave height exceeded two feet for 34 percent of the time. The calculated height of the highest wave of all during the nine years was 14.5 feet. It is inferred that the most probable value of the height of the highest wave in 50 years is likely to be about 19 feet. (Sinha-OEIS)
W74-04607

SHALLOW WATER WAVES: A COMPARISON OF THEORIES AND EXPERIMENTS,
Tetra Tech, Inc., Pasadena, Calif.
B. Le Mehaute, D. Divoky, and A. Lin.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 7, p 86-107, 1969. 11 fig, 28 ref. DASA-01-67-C-0099.

Descriptors: *Shallow water, *Waves(Water).
Identifiers: Velocity field, *Cnoidal wave theory, Solitary waves, Airy theory, Water depths.

A series of experiments were performed to determine the velocity field and other characteristics of large amplitude shallow water waves. The experimental results were compared with the predictions of a variety of wave theories including those commonly used in engineering practice. While no theory was found exceptionally accurate, the cnoidal wave theory of Keulegan and Patterson appears most adequate for the range of wavelengths and water depths studied. (Sinha - OEIS)
W74-04609

BREAKING WAVE CRITERIA; A STUDY EMPLOYING A NUMERICAL WAVE THEORY,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
R. G. Dean.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 8, p 108-123, 1969. 7 fig, 1 tab, 15 ref. DACW72-67-C-0009.

Descriptors: *Shallow water, *Waves(Water).
Identifiers: *Numerical wave theory, Stream function, *Wave height, Water depth, Stability criteria, *Breaking waves.

For progressive waves, the kinematic stability parameter, rather than the dynamic parameter, governs breaking. The dynamic criterion was found to equal zero at breaking; this implies that immediately under the crest, hydrostatic conditions prevail. The enclosed crest angle associated with the limiting wave is approximately equal to 120 degrees, a value determined by previous investigators. Earlier investigators. Earlier investigators, however, required the a priori assumption that the crest form be an angle which is a submultiple of 360 degrees. The breaking wave heights determined here are somewhat higher (0 to 28 percent) than those usually referenced. The stream function wave theory appears well suited for representing the geometry, kinematics, and dynamics of periodic water wave systems up to breaking conditions. (Sinha - OEIS)
W74-04610

HYPERBOLIC WAVES AND THEIR SHOALING,
Kyoto Univ. (Japan). Dept. of Civil Engineering.
Y. Iwagaki.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 9, p 124-144, 1969. 11 fig, 23 ref.

Descriptors: *Coasts, *Waves(Water), *Shallow water.
Identifiers: *Hyperbolic waves, Wave theory, *Shoaling.

Formulae are proposed for various wave characteristics of waves referred to as 'hyperbolic waves'. This theory of the waves does not contain the Jacobian elliptic function but does use the primary function. A combination of the hyperbolic wave theory and the Stokes wave theory make it possible to give a qualitative description of finite amplitude wave characteristics in shallow water before the waves break. (Sinha - OEIS)
W74-04611

EFFECT OF BEACH SLOPE AND SHOALING ON WAVE ASYMMETRY,
M. D. Adeyemo.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. Americal Society of Civil Engineers, Vol 1, Part 1, Chap 10, p 145-172, 1969. 11 fig, 17 ref, 2 plates.

Descriptors: *Beaches, Slopes, *Shallow water, *Waves(Water), Coasts.
Identifiers: *Shoaling, Wave asymmetry, *Breaker zone, *Oscillatory waves.

The geometrical asymmetry associated with shallow water oscillatory waves in the breaker zone is discussed. Three descriptions of wave asymmetry are defined and examined: Wave vertical asymmetry; Wave slope asymmetry; and Wave horizontal asymmetry. The effects of shoaling, produced by beaches of different slope, on the wave asymmetry are examined. Six beach slopes in the range 1:4 to 1:18 were employed, and a quantitative correlation was found to exist between the wave slope asymmetry, wave horizontal asymmetry and the wave vertical asymmetry. An expression is given for the wave horizontal asymmetry based on the expression for the wave vertical asymmetry from the cnoidal wave theory. The theoretical study of wave slope asymmetry made by Biesel and the results of the experimental work on the wave slope asymmetry in the present work were compared and gave a good agreement. (Sinha - OEIS)
W74-04612

THE EFFECTS OF BOTTOM CONFIGURATION ON THE DEFORMATION, BREAKING AND RUN-UP OF SOLITARY WAVES,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
F. E. Camfield, and R. L. Street.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 11, p 173-189, 1969. 11 fig, 11 ref.

Descriptors: *Waves(Water), Topography, Slopes, *Shallow water, Continental shelf, *Bores.
Identifiers: *Solitary waves, Run-up, *Shoaling, Breaking, *Bottom configuration, Long waves.

An initial set of experiments investigated the effect of the initial bottom slope on the breaking and run-up of a wave on a second, higher slope. A second set of experiments considered the effect of a continental shelf configuration on the transmissibility of waves in the shoreward direction, and the decomposition of the waves due to the shallower water depth on the continental shelf. It was found that, in order to make predictions at or near the shoreline for waves generated in deep water, it is necessary to consider the total configuration of the bottom leading to the shoreline. The results for a low initial slope followed by a second higher slope show that the initial slope has a significant effect on both the breaking height and the run-up of the waves. The experiments showed qualitative trends which could be used to predict the effects of various slope combinations. (Sinha - OEIS)
W74-04613

WAVE REFLECTION AND TRANSMISSION IN CHANNELS OF VARIABLE SECTION,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-04614

SPECTRA OF THE TEMPERATURE AND HUMIDITY FLUCTUATIONS AND OF THE FLUXES OF MOISTURE AND SENSIBLE HEAT IN THE MARINE BOUNDARY LAYER,
Oregon State Univ., Corvallis. Dept. of Oceanography.
G. T. Phelps, and S. Pond.
Journal of the Atmospheric Sciences, Vol 28, p 918-928, September 1971. 1 tab, 8 fig, 9 ref.

Descriptors: *Temperature, *Humidity, *Fluctuations, *Turbulent boundary layers, *Theoretical analysis, Oceanography, Atmosphere, Moisture, Heat, Velocity, Air-water interfaces, Analytical techniques, Data collections, Data processing, Mathematical models, Statistics.

Data from the Barbados Oceanographic and Meteorological Experiment and from a pre-BOMEX cruise near San Diego are analyzed with emphasis on the similarities and differences between temperature and humidity and on their cospectra and correlations with the velocity fluctuations. Temperature and humidity fluctuations were very similar with only minor differences in data from both San Diego experiments and BOMEX. In the BOMEX the low frequency ends of the temperature spectra were much lower than in San Diego, and consequently, so are the low frequency ends of the temperature-vertical velocity cospectra. On the basis of these results and comparison with other studies it is concluded that the humidity spectra and humidity-vertical velocity cospectra have universal forms when normalized according to the Monin-Obukhov similarity theory. The temperature spectra cannot be interpreted in terms of similarity theory because this theory does not include the effects of radiative transfer. Temperature and humidity are not similar scalars and measurements for one are not necessarily indicative of the behavior of the other. (Jerome-Vanderbilt)
W74-04672

MEASUREMENTS OF THE TURBULENT FLUXES OF MOMENTUM, MOISTURE AND SENSIBLE HEAT OVER THE OCEAN,
British Columbia Univ., Vancouver. Inst. of Oceanography.
S. Pond, G. T. Phelps, J. E. Paquin, G. McBean, and R. W. Stewart.
Journal of Atmospheric Sciences, Vol 28, p 901-917, September 1971. 1 tab, 7 fig, 26 ref, 1 append.

Descriptors: *Measurement, *Turbulent boundary layers, *Fluctuations, *Moisture, *Heat, *Oceans, Oceanography, Atmosphere, Data collection, Data processing, Turbulence, Momentum equation, Analytical techniques, Instrumentation, Aerosols, Velocity, Mathematical models, Model studies, Evaluation, Theoretical analysis, Wind velocity, Humidity, Evaporation.

Results are described of the fluxes of momentum, moisture, and sensible heat by both the eddy correlation and dissipation techniques. The data were collected on the R/V 'Flip' during the Barbados Oceanographic and Meteorological Experiment and during a pre-BOMEX cruise near San Diego. The instrumentation, methods of determining flux and methods of data analysis are described. The spectra of the three components of velocity fluctuations and the cospectra between vertical fluctuations and the downstream velocity, temperature and humidity fluctuations are presented. The fluxes determined by the eddy correlation are compared with those estimated from rates of dissipation, and these fluxes are then used to evaluate the constants in the bulk aerodynamic formulas. The normalized vertical downstream cospectra appear to have universal forms and are similar to earlier results. The normalized vertical temperature cospectra do not appear to have a universal form. The dissipation and eddy correlation methods were found to agree well for momentum flux. The moisture flux shows a strong correlation with wind speed times the mean sea-air humidity difference. This result was based on direct measurements of the flux and agrees well with earlier estimates from evaporation pan data. (Jerome-Vanderbilt)
W74-04673

COMMENTS ON JOHNSON'S PAPER, 'ON THE WIND-DRIVEN CIRCULATION OF A STRATIFIED OCEAN',
RAND Corp., Santa Monica, Calif.
R. C. Alexander.
Journal of Marine Research, Vol 31, No 1, p 87-89, 1973. 5 ref.

Descriptors: *Ocean circulation, *Wind, *Temperature, *Evaluation, Oceanography, Turnovers, Upwelling, Boundary layers, Model studies, Mathematical models, Theoretical analysis, Mixing.

Johnson's (1971) (See W73-13429) assumptions of zero net transport of water from the interior into the eastern boundary region at every latitude and an exponential solution to the thermocline problem create discripancies in his predictions. Although his assumptions seem plausible, they are not obviously true because a net change in north-south flow in the boundary region between some two latitudes might require net east-west flow from the interior at intervening latitudes. The assumption of a balance between transports in the upper and intermediate layers when applied to the intermediate solution leads to values of temperature that increase too rapidly with decreasing latitude to agree with nature. Johnson's results concerning eastern-boundary region and upwelling are based on assumptions rather than analysis, and the observable quantity, temperature, does not agree with nature. More complete analysis of the eastern-boundary region is necessary. (Jerome-Vanderbilt)
W74-04675

FIELD MEASUREMENTS OF SWELL OFF THE ISLAND OF ARUBA,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
W. S. Wilson.
Available from NTIS as AD-694 443 for $6.00 paper copy, $1.45 microfiche. Technical Report No 56, prepared for the Office of Naval Research, Reference 69-9, August 1969. 64 p, 31 fig, 3 tab, 13 ref. Nonr 4010(11).

Descriptors: *Island, Coasts, *Refraction(Waterwaves), *Waves(Water), *Storms, Wave propagation.
Identifiers: Trade Winds, *Venezuela(Aruba), *Swell, Wave ray patterns, Caribbean Sea, Mona Passage.

Intermittently during the winter, swell and associated breakers appear along a beach on the lee side of Aruba, an island off the coast of Venezuela in the Trade Winds. It has been suggested that 14- to 15-sec waves, generated by winter storms off the mid-Atlantic coast of North America, propagate southward to Mona Passage where they are refracted. They then propagate across the Caribbean Sea toward Aruba where they are refracted off the northwest tip of the island and arrive on the leeward coast. Measurements of swell off the beach have been conducted during March 1969. The instrumentation, field procedure, and computational methods are described. Spectra, directions of travel for the swell, and probable generation areas are presented. Reasonable agreement is found between measured swell directions and directions deduced from wave-ray patterns. All evidence obtained is consistent with the hypothesis of a North Atlantic generation area. (Sinha-OEIS)
W74-04723

WAVE FORECASTING RELATIONSHIPS FOR THE GULF OF MEXICO,
Corps of Engineers, Washington, D.C. Beach Erosion Board.

C. L. Bretschneider.
Technical Memorandum No 84, December 1956. 27 p, 16 fig, 1 tab, 21 ref, append.

Descriptors: *Forecasting, *Waves(Water), Numerical analysis, Slopes, Winds, Statistics, Topography, Coasts, *Gulf of Mexico.
Identifiers: *Bottom friction, Wind generated waves, *Hindcasting, *Wind waves, Averaging techniques.

The development and application of a method for computing wind wave data over the Continental Shelf along the United States coast of the Gulf of Mexico is described. A set of generalized forecasting curves is required for each location and each direction to bring the waves in over the shallow sloping bottom to the desired depth. Using deep-water forecasting relationships and taking bottom friction into account, a generalized set of dimensionless forecasting relationships is prepared for each of five locations for which statistical deep-water wave data are compiled. The forecasting curves are intended for the most frequent minimum fetch and corresponding wind speed for various deep-water wave height ranges and average bottom conditions of various directions. For the cases of winds parallel to the coast or from land to sea the curves are applicable to all water depths. However, for the case of winds blowing from sea toward land, the forecasting relationships are satisfactory only for depths of about 20 feet or greater, although the technique has been stretched to a depth of 12 feet for cases where winds are not too high. At depths of about 20 feet or less the bottom slope changes too rapidly for the theory to apply, and longer period swell will be breaking in the surf zone, thereby obscuring the wind wave pattern. (Sinha-OEIS)
W74-04729

CHARACTERISTICS OF STREAMFLOW AT GAGING STATIONS IN THE LOUP RIVER BASIN, NEBRASKA,
Geological Survey, Lincoln, Nebr.
F. B. Shaffer.
Open-file Report 7401, January 1974. 105 p, 16 fig, 7 ref.

Descriptors: *Streamflow, *Nebraska, Statistics, Discharge(Water), Hydrographs, Data collections, *Hydrologic data, Diversion, Withdrawal.
Identifiers: *Loup River(Nebr).

Statistics are presented on the flow of streams in the Loup River basin, Nebraska. As major irrigation projects have been constructed in the basin since gaging of streamflow was begun, the complete record of water discharge at some gaging stations includes periods before and after streamflow was first affected by diversions to an upstream project. Streamflow statistics and exceedence probability graphs of daily discharge are presented for nine sites on the Middle Loup River and its tributaries, seven on the North Loup and its tributaries, and seven on the Loup River and its tributaries below the confluence of the North and Middle Loup Rivers. Also presented are exceedence probability graphs for six canals diverting from the Middle Loup River and for three canals diverting from the North Loup River. (Knapp-USGS)
W74-04794

SURFACE- AND GROUND-WATER CONDITIONS DURING 1959-61 IN A PART OF FLETT CREEK BASIN, TACOMA, WASHINGTON,
Geological Survey, Tacoma, Wash.
F. M. Veatch, G. E. Kimmel, and E. A. Johnston.
Open-file report, 1966. 42 p, 20 fig, 7 tab.

Descriptors: *Surface-groundwater relationships, *Hydrologic data, *Alluvial channels, *Washington, Discharge(Water), Streamflow, Hydrogeology.
Identifiers: Tacoma(Wash).

The Flett Creek area near Tacoma, Washington, was studied to define its groundwater and surface-water characteristics. The study is intended to provide a basis for comparisons and analyses of changes in water regimen that may develop as a result of man's activities, including construction of storm sewers and landfill, and expansions in population, industry, and water use. Much of the Flett Creek channel lies on thick beds of peat; these, in turn, are underlain by permeable glacial deposits. The groundwater and surface water are in hydraulic continuity except in one short reach. In some reaches the creek alternately gains and loses flow depending on the position and slope of the adjacent water table. The flow of Flett Creek ranged from 1.2 to 40 cfs during the period May 1959 to December 1961. The chemical quality of the surface runoff and the water from wells is roughly the same, although minor seasonal variations between them occur. Water from both sources is generally soft and low in mineral content. The construction of a new deeper channel for the creek, for passing increased flood inflow from storm sewers, would have the ultimate effect of depressing the water table adjacent to the creek by an amount approximating the depth of excavation. The peat would present problems in channel construction, and would seriously affect the structural stability of an enlarged channel. (Knapp-USGS)
W74-04796

THE FALLACY OF BAER'S LAW OR CORIOLIS' EFFECT ON THE MEANDERING OF RIVERS,
Karachi Univ. (Pakistan).
For primary bibliographic entry see Field 8B.
W74-04799

POWER LAW DEPENDENCE ON TIME OF RIVER FLOOD DECAY AND ITS RELATIONSHIP TO LONG-TERM DISCHARGE FREQUENCY DISTRIBUTION,
California Univ., Los Angeles. Dept. of Planetary and Space Science.
For primary bibliographic entry see Field 4A.
W74-04806

HYDROLOGIC DATA FOR SMALL RURAL CATCHMENTS IN AUSTRALIA, 1973,
Snowy Mountains Engineering Corp., Cooma (Australia).
J. A. H. Brown.
Australian Water Resources Council Technical Paper No 6 (Research Project No 68/1), 1973. 146 p, 1 fig, 2 tab, 9 ref, 14 append.

Descriptors: *Data collections, *Small watersheds, *Australia, *Hydrologic data, Runoff, Floods, Flood control, Data storage and retrieval, Data processing.

The Australian Water Resources Council's Research Project 68/1 on the hydrology of small rural catchments involved the review, compilation, processing and analysis of data from small rural catchments (less than 10 sq mile). The ultimate aim was improving techniques for estimating yields and floods from these catchments. A large volume of streamflow and rainfall data were processed and stored on magnetic tape. Soils data and topographic data were also compiled and preliminary analysis of the data carried out. The report contains detailed lists of all the data which were processed, a summary of the analyses that were carried out, and recommendations for future activities. (Knapp-USGS)
W74-04842

2F. Groundwater

STUDIES ON THE VALIDITY OF DARCY'S LAW FOR FLOW IN NATURAL SANDS,
Georgia Univ., Athens. Dept. of Geology.
R. E. Carver.
Available from National Technical Information Service as PB-228 022 $3.75 in paper copy, $1.45 in microfiche. Georgia Institute of Technology Environmental Resources Center, Atlanta Report, ERC-1573, November 1973, 44 p, 7 fig, 30 ref, 2 append. OWRR A-037-GA(1). 14-31-0001-3810.

Descriptors: *Darcy's Law, *Permeability,Transmissivity, Hydraulic conductivity, Saturated flow, Non-newtonian flow, *Subsurface flow, Porous media, Permeameters, Wells, *Sands.
Identifiers: *Well entrance losses.

Well entrance losses are commonly assumed to be due, in part, to non-Darcy flow near the well, but concrete evidence for non-Darcy flow of water in natural sands at any reasonably large macroscopic flow velocity does not appear to exist. On the other hand, at very low flow velocities, the permeability of sands varies with macroscopic flow velocity in a very complex way, and some earlier studies purporting to support the validity of Darcy's Law at very low flow velocities actually support this view. With increasing flow velocity, beginning with velocities below 0.005 cm/sec, permeability increases rapidly in the alpha intergranular flow regime, decreases rapidly through the beta flow regime, increases relatively slowly with increasing velocity in the gamma flow regime, then remains nearly constant or decreases in the delta flow regime. The changes in flow resistance appear to be related, in part, to the surface chemistry of quartz. Experiments at high flow velocities showed no dramatic change in permeability in the range of 1 to 2 cm/sec., but, because of problems with piezometry, the results are not considered conclusive. One basic cause of 'well entrance losses' probably is over estimation of the average permeability of the aquifer, either because gas permeameters are used, or because tests with water are conducted in the first three flow regimes.
W74-04307

THE RESPONSE TO TIDAL FLUCTUATIONS OF A LEAKY AQUIFER SYSTEM,
Hawaii Univ., Honolulu. Water Resources Research Center.
J. A. Williams, and T. C. Liu.
Available from National Technical Information Service as PB-227 847 $5.25 in paper copy, $1.45 in microfiche. Technical Report No 66, July 1973. 41 p, 9 fig, 7 ref, append. OWRR A-020-HI(2). 14-31-0001-3211.

Descriptors: *Aquifers, *Tides, Groundwater, *Base flow, *Mathematical models, Computer programs, Tidal waters, Model studies.
Identifiers: *Leaky aquifers, Response tides, Wave propagation.

A system of two isotropic and homogeneous infinite aquifers, which are separated by an aquitard and subject to tidal fluctuations along their coastal boundary, has been analyzed and a mathematical model has been developed for the response of this system to tidal changes. The mathematical model consists of equations for the amplitude and phase of the response of both aquifers to a periodic tide. A computer program using the IBM 360 has been written for the evaluation of these equations. Both the mathematical model and the program have been verified by an electric analog model constructed for that purpose. The mathematical model was evaluated for an aquifer system where both aquifers have the same transmissability (and therefore the same leakage factor) but where the storage of the upper aquifer was 100 times that of the lower aquifer. Tidal periods of 0.5, 1, and 14 days were used. The results indicate that deviations from a response corresponding to the no-leakage case could be from 50 to 100 percent or more for both the amplitude and the phase angle of either aquifer. Also, such deviations were produced by a relatively moderate amount of leakage, i.e., 1/B sq > or = to 0.154/10,000 sq ft.
W74-04308

GROUNDWATER INVESTIGATIONS IN PERMAFROST REGIONS OF NORTH AMERICA: A REVIEW,
Geological Survey, Boston, Mass.
J. R. Williams, and R. O. van Everdingen.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 435-446, 1973. 73 ref.

Descriptors: *Permafrost, *Groundwater, *Arctic, *Reviews, Surface-groundwater relationships, Groundwater basins, Saline water-freshwater interfaces, Hydrogeology.

Typical recent and current studies dealing with water balance of small basins, saline water-freshwater interface in arctic deltas, location of water supplies in arctic regions, and occurrence of artesian pressures and their effects on wells and pipelines in permafrost areas are reviewed. A natural consequence of the basin hydrology approach is the current application of mathematical and conceptual models to simulate the operation of the hydrologic cycle. Lack of data on infiltration rates, soil moisture, distribution of permafrost, and on hydraulic conductivity of the subsurface materials has prevented assessment of the groundwater component in the basins studied. Groundwater studies are part of the evaluation of the impact of proposed developments on the environment. In these studies, less emphasis is placed on groundwater supply and more on the role of groundwater and frost-heaving pressures developed during the freeze-thaw cycle and their effect on slope and riverbed stability and on the nature and extent of icings. Increased exploration for oil and gas in the North American Arctic has yielded extensive information on groundwater flow systems and quality of water in bedrock aquifers. (See also W74-04346) (Knapp-USGS)
W74-04391

GROUNDWATER PORE PRESSURES ADJACENT TO SUBARCTIC STREAMS,
Alaska Univ., College.
For primary bibliographic entry see Field 2C.
W74-04393

RECHARGE OF A CENTRAL ALASKA LAKE BY SUBPERMAFROST GROUNDWATER,
Alaska Univ., College.
D. L. Kane, and C. W. Slaughter.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 458-462, 1973. 3 fig, 11 ref.

Descriptors: *Permafrost, *Lakes, *Alaska, *Surface-groundwater relationships, Discharge(Water), Hydrogeology, Temperature, Groundwater movement.

The existence of an unfrozen zone beneath a lake surrounded by permafrost and recharge of the lake from subpermafrost aquifers through the thawed zone were shown both by piezometer and temperature data. In the zone of discontinuous permafrost, including the lowlands of central Alaska, it is likely that many lakes indicate hydrologic connections between subpermafrost aquifers and the surface. While the bog lake studied is a point of discharge for groundwater, other small lakes might be either recharge or discharge points for subpermafrost aquifers. (See also W74-04346) (Knapp-USGS)
W74-04394

RISK OF UNCONTROLLED FLOW FROM WELLS THROUGH PERMAFROST,
Cold Regions Research and Engineering Lab., Hanover, N.H.
K. A. Linell.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 462-468, 1973. 6 fig, 2 tab, 4 ref.

Descriptors: *Water wells, *Permafrost, Wells, Frozen ground, Artesian wells, Well casings, Water temperature, Freezing, Thawing, Subsidence, *Alaska.

Where groundwater below permafrost is under artesian pressure, risk exists that piping, erosion, uncontrolled flow, settlement of wellhead facilities, and damage to the well casing may occur when a water well, oil well, or subsurface exploration boring is drilled through the permafrost. Possible consequences attending uncontrolled flow include formation of a constantly enlarging thaw and erosion pit at the well, permafrost degradation and terrain damage in the area exposed to surface and subsurface discharge from the well, ice fog and ground icing in winter, development of frost mounds, and waste of expensively developed water. Reestablishment of control may be difficult and expensive. Reliable, effective resistance to piping, erosion, and blowout under artesian pressure and flow conditions of significant magnitude in a well drilled through permafrost requires proper initial installation of the well casing, based on accurate knowledge and evaluation of the permafrost conditions. If the permafrost is thaw-stable, without excess ice, the casing should be tightly installed through the full permafrost zone, except that in thaw-stable bedrock casing is not needed unless for other reasons than thaw instability. If the permafrost is high-ice-content, thaw-unstable soil or rock, not only must the casing be tightly installed in the permafrost but the maintenance of a permanently frozen contact and seal between the casing and the permafrost may also be necessary. (See also W74-04346) (Knapp-USGS)
W74-04395

A GROUNDWATER SUPPLY FOR AN OIL CAMP NEAR PRUDHOE BAY, ARCTIC ALASKA,
Metcalf and Eddy, Inc., Boston, Mass.
R. G. Sherman.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 469-472, 1973. 2 fig, 12 ref.

Descriptors: *Groundwater, *Permafrost, *Arctic, *Alluvial channels, Alluvium, Frozen ground, Water supply, *Alaska, Ice, Water quality, Potable water.
Identifiers: *Sagavanirktok River(Alaska).

In designing an oil camp on the west bank of the Sagavanirktok River 11 km south of Prudhoe Bay, the first step was to locate a year-round supply of potable water. Permafrost thickness of as much as 610 m in the campsite area eliminated consideration of deep aquifers. Potential sources in lakes and in the nearby Sagavanirktok River and in aquifers beneath the lakes and the river were explored. A year-round supply of good quality water exists in an alluvial aquifer beneath the Sagavanirktok River. At sites near the coastline, the aquifer may be subject to saltwater encroachment, induced either by heavy pumping during periods of zero river flow or by natural upstream migration of the saltwater as flushing action of the freshwater underflow supported by streamflow ceases. (See also W74-04346) (Knapp-USGS)
W74-04396

PREDICTION OF THE 1972 MANAGUA, NICARAGUA, EARTHQUAKE FROM GROUNDWATER CHANGES, INFERRED PROBABILITY OF EARTHQUAKES IN THE CITY OF MANAGUA, NICARAGUA, DURING THE SUMMER OF 1973,
Santos and Heilemann, Managua (Nicaragua).
C. Santos.
Available from NTIS, Springfield, Va 22151, AD-762 134 Price $3.00 printed copy; $1.45 microfiche. Army Engineer Waterways Experiment Station Translation No 73-7, May 1973. 19 p, 3 fig, 5 tab, 8 ref.

Descriptors: *Earthquakes, *Recharge, *Water levels, *Groundwater, Faults(Geologic), Geophysics, Droughts, Rainfall. Infiltration.
Identifiers: *Nicaragua(Managua).

Earthquakes in Managua, Nicaragua, are relatable to drought years and restrictions to replenishment of the Managua aquifer. Changes in water loading induce stresses which are relieved by fault movement and corresponding earthquakes. The December 1972 Managua earthquake was predicted before the event. These significant observations should be supplemented by other measurements such as geodetic strain, tilt, gravimetric anomalies, etc. There is a need to investigate hydrologic cycles in relation to tectonic activity in many earthquake-prone areas. (Knapp-USGS)
W74-04467

HYDROGEOLOGIC CHARACTERISTICS OF THE SURFICIAL AQUIFER IN NORTHWEST HILLSBOROUGH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
W. C. Sinclair.
Open-file report 73023, 1973. 97 p, 4 tab, 10 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Florida, *Groundwater movement, Leakage, Recharge, Permeability.
Identifiers: Floridan aquifer, Hillsborough County(Fla).

Lithologic and gamma logs of 59 test holes in Hillsborough County, Florida, were used in conjunction with laboratory analyses of samples to define the hydrogeology of the unconsolidated deposits of the surficial aquifer overlying the limestone Floridan aquifer. The surficial aquifer comprises an upper fine sand unit which averages about 15 feet thick and a lower sequence of sandy clay and clayey sand layers which average about 25 feet thick. Median grain size, specific yield, and vertical permeability of the surficial aquifer decrease downward. The coefficient of vertical permeability of the sand is about 100 gallons per day per square foot, but the coefficient of vertical permeability of the lower sand and clayey sand is much lower ranging from 0.01 to 0.1 gallon per day per square foot. A confining layer of dense clay underlies the surficial aquifer separating it from the Floridan aquifer below. The potentiometric surface in the surficial aquifer stands an average of 10 feet above that in the Floridan. Leakage from the surficial aquifer to the Floridan occurs through the confining layer as well as through perforations in the confining layer. A regional estimate of leakage, based on the average coefficient of vertical permeability, is about 140,000 gpd per square mile. (Knapp-USGS)
W74-04468

EVALUATION OF THE GROUND-WATER SUPPLY AT EIGHT SITES IN GLACIER NATIONAL PARK, NORTHWESTERN MONTANA,
Geological Survey, Helena, Mont.
A. J. Boettcher.
Open-file report, 1974. 30 p, 17 fig, 2 tab, 2 ref.

Descriptors: *Groundwater, *National parks, *Montana, Hydrogeology, Water resources development, *Water supply, Water yield, *Water quality, Calcium, Bicarbonates.
Identifiers: Glacier National Park(Mont).

Seven of eight test holes drilled in Glacier National Park derive water from the Quaternary alluvial or glacial deposits. The eighth test hole was dry. Aquifer tests indicated that production wells at the seven sites will yield enough water for domestic or campground uses. Estimated maximum pumping rates range from 4 to 50 gallons per minute. The water is of excellent chemical quality and the major dissolved constituents are calcium and bicarbonate. (Knapp-USGS)
W74-04469

GROUND WATER AND THE GEOTHERMAL RESOURCE.
Geraghty and Miller, Port Washington, N.Y.
For primary bibliographic entry see Field 4B.
W74-04586

MISSISSIPPIAN AQUIFER OF IOWA,
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 7C.
W74-04843

2G. Water In Soils

PERMAFROST: NORTH AMERICAN CONTRIBUTION TO SECOND INTERNATIONAL CONFERENCE.
For primary bibliographic entry see Field 2C.
W74-04346

INFLUENCE OF CLIMATIC AND TERRAIN FACTORS ON GROUND TEMPERATURES AT THREE LOCATIONS IN THE PERMAFROST REGION OF CANADA,
National Research Council of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 2C.
W74-04348

GEOPHYSICAL IDENTIFICATION OF FROZEN AND UNFROZEN GROUND, ANTARCTICA,
Northern Illinois Univ., De Kalb.
For primary bibliographic entry see Field 2C.
W74-04360

PERMAFROST AND SNOWCOVER RELATIONSHIPS NEAR SCHEFFERVILLE,
McGill Univ., Schefferville (Quebec). McGill Sub-Arctic Research Lab.
For primary bibliographic entry see Field 2C.
W74-04362

GROWTH OF PATTERNED GROUND IN VICTORIA LAND, ANTARCTICA,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 2C.
W74-04367

A SIMULATION SENSITIVITY ANALYSIS OF THE NEEDLE ICE GROWTH ENVIRONMENT,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 2C.
W74-04370

SOIL DEVELOPMENT AND PATTERNED GROUND EVOLUTION IN BEACON VALLEY ANTARCTICA,
Washington Univ., Seattle.
F. C. Ugolini, J. G. Bockheim, and D. M. Anderson.
In: International Conference on Permafrost, Yakutsk, USSR, 1973. p 246-254, 1973. 7 fig, 2 tab, 15 ref.

Descriptors: *Soil formation, *Antarctic, *Permafrost, Soils, Freezing, Thawing, Frozen ground, Frozen soils, Frost, Frost action, Mass wasting, Solifluction.
Identifiers: Polygonal ground, Patterned ground, *Antarctica(Beacon Valley).

Soil formation in Antarctica is restricted not only by the limited extent of ice-free areas but also by the continuous low temperatures and the paucity of liquid water. Soils of continental Antarctica are of the desert type; they are devoid of an organic surficial layer, display coarse textures, are extremely dry, pulverulent, and show poor horizon distinction with minor textural and structural changes and little color differentiation. Two major soil units are distinguished in the northeast half of Beacon Valley, Antarctica. These two mappable units are related to the age of the glacial deposits and to the surficial expressions of nonsorted polygons. The soils of the well-developed polygons appear immature in contrast to the more mature conditions found in the poorly expressed polygons. The soils of the poorly expressed polygons have a fine texture, are more structured, are more oxidized, contain more salts, and have a greater thickness above the ice-cemented permafrost than the soils of the well-developed polygons. The soils of the centers are more developed than the soils of the troughs. The growth of the sand wedges is greatly affected by the degree of soil development in the troughs. Once the soils in the troughs have acquired a compound structure enhanced by the presence of salts and clays, they are not able to flow and, therefore, to fill the contraction cracks. This lack of uniformity in growth rate may account for the observed discrepancy between the age of the wedges and the degree of soil development. (See also W74-04346) (Knapp-USGS)
W74-04372

PHYSICS, CHEMISTRY, AND MECHANICS OF FROZEN GROUND: A REVIEW,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04373

THE UNFROZEN WATER AND THE APPARENT SPECIFIC HEAT CAPACITY OF FROZEN SOILS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04374

EFFECT OF POROSITY ON AMOUNT OF SOIL WATER TRANSFERRED IN A FREEZING SILT,
Rutgers - The State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 2C.
W74-04376

EVALUATION OF IN SITU CREEP PROPERTIES OF FROZEN SOILS WITH THE PRESSUREMETER,
Ecole Polytechnique, Montreal (Quebec).
For primary bibliographic entry see Field 2C.
W74-04377

SHOCK-WAVE STUDIES OF ICE AND TWO FROZEN SOILS,
California Univ., Livermore.
For primary bibliographic entry see Field 2C.
W74-04378

ENCOUNTERING MASSIVE GROUND ICE DURING ROAD CONSTRUCTION IN CENTRAL ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 4C.
W74-04420

EFFECTS OF GROUND-ICE VARIABILITY AND RESULTING THAW SETTLEMENTS ON BURIED WARM-OIL PIPELINES,
Mackenzie Valley Pipeline Research Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 4C.
W74-04422

ONE-DIMENSIONAL MODEL OF THE MOVEMENT OF TRACE RADIOACTIVE SOLUTE THROUGH SOIL COLUMNS: THE PERCOL MODEL,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5B.
W74-04444

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT, JULY-DECEMBER 1972,
Battelle Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5B.
W74-04452

STRONTIUM-90 AND CESIUM-137 LEVELS IN SOILS OF VARIOUS TYPES AT NIIGATA PREFECTURE, JAPAN,
Niigata Univ. (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 5B.
W74-04453

A RADIOLOGICAL ENVIRONMENTAL SURVEY AT EBR-II,
For primary bibliographic entry see Field 5B.
W74-04455

PHOSPHORUS RELATIONSHIPS IN RUNOFF FROM FERTILIZED SOILS,
Agricultural Research Service, Lafayette, Ind.
For primary bibliographic entry see Field 5B.
W74-04471

LAND DISPOSAL OF WASTE GASES: 1. FLOW ANALYSIS OF GAS INJECTION SYSTEMS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5E.
W74-04479

LAND DISPOSAL OF WASTE GASES: II. GAS FLOW FROM BURIED PIPES,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5E.
W74-04480

ON SOLVING THE UNSATURATED FLOW EQUATION: 2. CRITIQUE OF PARLANGE'S METHOD.
Australian National Univ., Canberra. Research School of Physical Sciences.
J. H. Knight, and J. R. Philip.
Soil Science, Vol 116, No 6, 407-416, December 1973. 4 fig, 2 tab, 12 ref.

Descriptors: *Unsaturated flow, *Equations, Mathematical studies, Numerical analysis, Soil water movement, Sorption.
Identifiers: *Parlange's method.

The physical content of Parlange's method of solving the flow equation is explored. His first approximation satisfies continuity in the integral sense, but the second and higher approximations do not. Approximations beyond the first lack of any constraining link between the separate steps of 'satisfying continuity' and 'satisfying Darcy's law', which make up each interation. There is, consequently, nothing in the procedure to ensure convergence. A detailed investigation establishes the nonconvergence of the method when applied to one-dimensional sorption. The first approximation is best, and the higher approximations make oscillations of increasing magnitude about the exact solution. Two illustrative examples are given. The utility of Parlange's method is thus simply the utility of the first approximation: the dependence of this on the shape of the diffusivity function and on the flux-concentration relation is discussed. The method cannot be applied to two- and three-dimensional systems other than radially

symmetrical ones. (See also W74-02464) (Knapp-USGS)
W74-04492

MEASUREMENT OF MOISTURE DIFFUSIVITY OF WET SWELLING SYSTEMS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
D. E. Smiles, and A. G. Harvey.
Soil Science, Vol 16, No 6, p 391-399, December 1973. 6 fig, 8 ref.

Descriptors: *Soil water movement, *Expansive soils, *Diffusivity, Saturated flow, Diffusion, Sorption.

A method for estimating the diffusivity function of a saturated swelling system is based on an equation linking the sorptivity, the diffusivity function, and the flux concentration, and uses appropriate values of the flux-concentration relation to set limits of the diffusivity function. For the material used in the experiments demonstrating the procedure, the calculation errors were no more than 7.5 percent. (Knapp-USGS)
W74-04493

ASPECTS OF COLOUR REMOVAL FROM PULP AND PAPER MILL EFFLUENTS,
Central Public Health Engineering Research Inst., Nagpur (India).
For primary bibliographic entry see Field 5D.
W74-04514

INFLUENCES OF SOIL DENSITY, CLAY SILT AND HUMUS CONTENT ON MEASUREMENTS OF SOIL WATER BY NEUTRON GAUGES, (IN GERMAN),
Technische Universitaet, Munich (West Germany). Institut fuer Pflanzenbau und Pflanzenzuechtung.
H. Hanus, A. Suess, and G. Schurmann.
Z Pflanzenernaehr Bodenkd. Vol 132, No 1, p 4-16, 1972, Illus, (English summary).
Identifiers: *Clay, *Humus, Measurements, Neutron gauges, *Silt, *Soil water, *Soil density, Organic matter.

Multiple regressions were used to establish calibration curves, whereby the measured pulse rate, the humus-, clay- and silt content, dry density of the soil and moist density were considered. Dry density was a main factor for determining the absolute water content in a soil when using a neutron gauge. There was no effect of the humus content, probably because of a lower density in soil with a high content of organic matter. It was assumed that with an increasing clay content the number of neutron absorbing ions also rose. The results of neutron gauge measurements showed after a correction for dry density an accuracy equivalent to 3-4 gravimetric readings with soil sample cores of 100 cm3. In cases where higher accuracy is required, soil factors other than dry density and clay and silt content should be considered. The necessary corrections for dry density and clay and silt content are shown in equations.--Copyright 1973, Biological Abstracts, Inc.
W74-04556

SOIL CRUSTING RELATED TO SPRINKLER INTENSITY,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-04560

A SIMULATION MODEL FOR EVALUATING IRRIGATION MANAGEMENT PRACTICES,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-04564

DETERMINATION OF SOIL MOISTURE BY REMOTE SENSING TECHNIQUES (OPREDELENIYE VLAZHNOSTI POCHVY DISTANTSIONNYMI AEROKOSMICHESKIMI METODAMI),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
B. V. Vinogradov.
Vodnyye Resursy, No 3, p 70-92, 1973. 18 fig, 54 ref.

Descriptors: *Soil moisture, *Measurement, *Remote sensing, *Satellites(Artificial), Spectroscopy, Photography, Surveys, Terrain analysis, Infrared radiation.
Identifiers: USSR.

Remote sensing methods of soil moisture determination were investigated in three principal regions of the spectrum: the visible region (wavelengths 0.4 to 0.7 microns); the infrared region (wavelengths 0.7 to 15.0 microns); and the microwave region (wavelengths 0.8 to 10.0 cm). Remote sensing techniques are examined in ground experiments and in simulation studies based on data from aircraft and spacecraft. Soyuz-9 reflection spectra, Gemini-4 photography, and Nimbus-1 images are analyzed in the visible region of the spectrum. Nimbus-3 and Apollo-9 daytime images in the near-infrared region and Cosmos-226 daytime and nighttime images in the far-infrared region are analyzed in the infrared region of the spectrum. Emitted radiation data obtained from Cosmos-243 are analyzed in the microwave region of the spectrum. A multispectral and multiscale system of repetitive surveys at wavelengths ranging from 0.5 to 12.0 microns and from 0.8 to 9.0 cm or more and including control information from ground and aircraft is recommended. (Josefson-USGS)
W74-04576

AN ANALYTICAL STUDY OF A COILED-PIPE HEAT SINK,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 8B.
W74-04589

QUICKCLAYS AS PRODUCTS OF GLACIAL ACTION: A NEW APPROACH TO THEIR NATURE, GEOLOGY, DISTRIBUTION AND GEOTECHNICAL PROPERTIES,
Leeds Univ. (England). Dept. of Civil Engineering.
J. G. Cabrera, and I. J. Smalley.
Engineering Geology, Vol 7, No 2, p 115-133, October 1973. 4 fig, 2 tab, 54 ref.

Descriptors: *Quick clays, *Glacial drift, Soil mechanics, *Clays, Clay minerals.

Quickclays are products of glaciation, which accounts for their limited distribution. Glacial grinding provides the fine silt and clay sizes required to constitute quickclays. Two major factors account for the geotechnical properties. A composition factor is related to material comprising the soil system and a leaching factor is related to the clay-mineral content of the soil. Soils can be divided into three types, based on criteria of particle size and type of interparticle bond. The three main soil types have: (a) small particles and long-range forces--the bond/weight ratio R is high; (b) small particles and short-range forces--R>1; and (c) large particles and short-range forces--R<1. The most important property is a preponderance of inactive bonds in the soil system. This is achieved by a high content of nonclay mineral particles, and also may be assisted by leaching and cementation. If more than a critical proportion of long-range bonds are present, the required very high sensitivity does not occur. The initial failure of the soil may be treated as tensile using a volume failure criterion; the low settling velocity of the very small particles allows the solid-liquid transformation to occur after a modest shock loading. Observations of low thixotropy, lack of secondary settlement and sudden failure in compression tests can be explained by requirements of particle size and material. (Knapp-USGS)
W74-04590

A NUMERICAL CLASSIFICATION OF SELECTED LANDSLIDES OF THE DEBRIS SLIDE-AVALANCHE-FLOW TYPE,
Macquarie Univ., North Ryde (Australia). School of Earth Sciences.
For primary bibliographic entry see Field 2J.
W74-04591

STRIATED GROUND, A TYPE OF PATTERNED GROUND IN THE PERIGLACIAL AREA OF THE VENEZUELAN ANDES, (IN SPANISH),
Instituto Venezolano de Investigaciones Cientificas, Caracas.
C. Schubert.
Acta Cient Venez. Vol 23, No 3, p 108-114. 1972. Illus. (English summary).
Identifiers: Diurnal melting, Nocturnal freezing, *Patterned ground, *Striated ground, Winds, *Venezuela(Andes area), *Periglacial areas.

Striated ground was found above 3600 m elevation in paramo de La Culata, Pico Espejo, and in the vicinity of Timoncito Glacier, in the Central part of the Venezuelan Andes. This ground is formed by the nightly freezing and diurnal melting of the water contained by the soil. The striae are a consequence of the alignment of lumps of fine to coarse sand, separated by small discontinuous channels, approximately 1-3 cm wide. The surfaces of striated ground generally are not wider than 1 m. Sorting was observed in the form of pebble-rich and pebble-poor zones. Striated ground in process of formation was observed in Pico Espejo. The needle ice, formed during the nocturnal freeze, filled the channels between striae. No sorting was observed, which is a probable indication of very recent formation of the feature, probably the night before. The orientation of the striae is compared with the wind direction measured in Pico Espejo. The formation of needle ice in the ground reflects the direction of the freezing wind and produces striae oriented in that direction--Copyright 1973, Biological Abstracts, Inc.
W74-04651

WATER REGIME IN ALLUVIAL FAN SOILS OF THE ARAKS RIVER, (IN RUSSIAN),
M. R. Abduev.
Izv Akad Nauk SSR Ser Biol Nauk. 4. p 47-53. 1971. Illus.
Identifiers: *Alluvial fan soils, Rivers, Soils, *USSR(Araks River), Groundwater, *Soil moisture.

From 1962-1965 small plots were laid out to include all soil diversity. The water regime in this alluvial fan is quite complex not only in separate zones of soils, but also in individual areas. At the same time some humidification and moisture dynamism appeared to be of more general character to these soils. A layer of pronounced humidification was marked in all plots, which increased in the direction of decreased slope. This must have been linked with the rise of ground water in this direction. Also the pronounced dynamism of moisture content in the profile of these soils seemed to be a common characteristic.--Copyright 1973, Biological Abstracts, Inc.
W74-04733

SPECTROPHOTOMETRIC ESTIMATION OF ARSENIC IN NITRIC ACID EXTRACTS OF SOIL AND SOIL ADDITIVES,
National Vegetable Research Station, Wellsbourne (England).
For primary bibliographic entry see Field 5A.
W74-04769

EFFECTS OF SALT CONCENTRATION CHANGES DURING FREEZING ON THE UNFROZEN WATER CONTENT OF POROUS MATERIALS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04802

WATER FLOW THROUGH SNOW OVERLYING AN IMPERMEABLE BOUNDARY,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04803

WATER CONDITIONS IN SOILS OF THE BOGAR ZONE OF THE UZBEK SSR,
A. A. Rode.
Available from NTIS, Springfield, Va. 22151 as TT-70-57115 for $3.00 printed copy; $1.45 microfiche. Indian National Scientific Documentation Centre, New Delhi, Technical Translation Report TT-70-57115, 1972. 53 p, 11 fig, 10 tab, 15 ref. (Originally published in Akademiya Nauk SSSR, Trudy Pochevennogo Instituta im. V. V. Dokuchaeva, Vol 25, p 94-129, 1947).

Descriptors: *Soil moisture, *Water balance, Soil water movement, Soil management, Mulching.
Identifiers: *USSR(Uzbek SSR-Bogar zone).

The water regime of soils of the bogar zone of the Uzbek SSR is of the impermacidal type (according to the terminology of Vysotskii). The annual depth of moisture penetration does not exceed 1 m and the water content which attains the value of water-holding capacity of soils rarely exists beyond this depth. The moisture exchange as a whole takes place in the soil layers only to the depth of 2.5 m. The soil moisture during a year varies from the values somewhat exceeding water holding capacity (field water capacity) to wilting moisture. The moisture reserve in soils starts increasing from the end of October and attains the maximum value in the end of March or beginning of April. After this period it starts decreasing until the precipitation stops. In summer months when the moisture reserve approaches the minimum value, its rate of decrease again falls. The soils which are under crops or wild plants lose all the moisture they receive in form of precipitation. The soils which are not covered with plants (bare fallow) lose less than the loss in case of soils covered with plants. Therefore, bare fallow, if properly cared, serves as a means to preserve moisture. (Knapp-USGS)
W74-04809

2H. Lakes

REMOTE SENSING IN SAMPLING SITE LOCATION IN LAKES AND STREAMS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W74-04313

NUTRIENT INCOME CHANGE RELATED TO PLANKTON ALGAE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W74-04318

LITTORAL TRANSPORT IN THE GREAT LAKES,
United States Lake Survey, Detroit, Mich.
For primary bibliographic entry see Field 2J.
W74-04334

MODIFICATION OF NEARSHORE CURRENTS BY COASTAL STRUCTURES,
United States Lake Survey, Detroit, Mich.
For primary bibliographic entry see Field 8B.
W74-04341

CURRENTS AT HARBOR BEACH, MICHIGAN,
United States Lake Survey, Detroit, Mich.
For primary bibliographic entry see Field 5B.
W74-04342

VERTICAL DISTRIBUTION OF FISHES RELATIVE TO PHYSICAL, CHEMICAL AND BIOLOGICAL FEATURES IN TWO CENTRAL ARIZONA RESERVOIRS,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 5C.
W74-04474

NUTRIENTS IN SUBSURFACE AND RUNOFF WATERS OF THE HOLLAND MARSH, ONTARIO,
Ministry of the Environment, Rexdale (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5B.
W74-04478

RELATIVE SUSCEPTIBILITY OF LAKES TO WATER-QUALITY DEGRADATION IN THE SOUTHERN HOOD CANAL AREA, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 5B.
W74-04488

LAKES IN THE BOULDER-FORT COLLINS-GREELEY AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Washington, D.C.
J. F. Ficke, and T. W. Danielson.
For sale by USGS, Washington, D.C. 20244, Price - $0.75. Miscellaneous Investigations Series Map I-855-A, 1973. 1 sheet, 1 map, 1 tab.

Descriptors: *Water quality, Lakes, *Mapping, *Colorado, *Specific conductivity, Data collections, Surveys, Dissolved solids, Water types, Light penetration, Secchi disks, Biological properties, Algae, Reviews.
Identifiers: *Lakes inventory(Colo).

Results are summarized of an inventory of the lakes in the northern one-third of the Colorado Front Range Urban Corridor. The inventory was conducted to assemble information that might be helpful in planning the best and most beneficial use of lakes in an area of rapid population growth. Lake size and water-quality data are included. Size data include most of the lakes of 2 hectares (20,000 square meters, about 5 acres) or greater. Water-quality data are provided for most lakes larger than 10 hectares (about 25 acres). As expressed by values of specific conductance is micromhos per centimeter, most of the lakes contained water of good quality. Conductance was 750 or less in 57 of the 115 lakes measured; it ranged from 750 to 1,500 in 30 lakes, ranged from 1,500 to 4,500 in 21 lakes, and exceeded 4,500 in only 7 lakes. Samples from Button Rock Reservoir, Flatiron Reservoir, and Pinewood Lake had specific conductance less than 40. The highest conductance waters were from Coleman Reservoir (12,000), Newell Lake (12,500), and 27 unnamed lake (15,000) located 3.5 kilometers north-northeast of Berthoud. Most of the lakes in the corridor contained water that is alkaline. Transparency, as measured by a Secchi disk, was less than 1.2 meters in 87 of the 112 lakes in which it was measured. Algal concentrations ranged from 77 to 13,000 cells per milliliter in samples collected from 23 lakes. (Woodard-USGS)
W74-04496

A PRELIMINARY SURVEY OF THE POSSIBLE CONTAMINATION OF LAKE NAKURU IN KENYA WITH SOME METALS AND CHLORINATED HYDROCARBON PESTICIDES,
Utrecht Rijksuniversiteit (Netherlands). Inst. of Veterinary Pharmacology and Biological Toxicology.
For primary bibliographic entry see Field 5C.
W74-04547

WATER LEVEL FLUCTUATIONS OF THE CASPIAN SEA (K PROBLEME UROVENNOGO REZHIMA KASPIYSKOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
D. Ya. Ratkovich, I. S. Zhdanova, and V. Ye. Prival'skiy.
Vodnyye Resursy, No 3, p 45-69, 1973. 9 fig, 8 tab, 18 ref.

Descriptors: *Lakes, *Water levels, *Water level fluctuations, Variability, Water balance, Inflow, Evaporation, Runoff, Statistical methods, Statistical models, Probability, Forecasting, Curves, Equations.
Identifiers: *USSR, *Caspian Sea.

The level of the Caspain Sea is undergoing fluctuations induced by the natural variability of inflow to the sea and of evaporation from its surface. Under present climatic conditions the range of natural fluctuations in level may be about 3 m. As a result of withdrawals of runoff from rivers of the Caspian basin, the average level of the sea has dropped by about 2 m to its present elevation of about 28.5 m below sea level. A further decline in level by more than 1.0-1.5 m will inflict great damage on fish stocks of the sea. Under average hydrometeorological conditions and with an intensive increase in water consumption, the level of the sea may decline an additional 2.0-2.5 m by the year 2000. Measures to replenish the water resources of the sea and to curtail evaporation from its surface can, to a great extent, prevent a further drop in sea level and avoid severe consequences for the national economy of the country. According to preliminary data, it is quite possible to hold the further decline in sea level to about 1 m. (Josefson-USGS)
W74-04575

WAVE ACTION AND BREAKWATER DESIGN, HAMLIN BEACH HARBOR, NEW YORK,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W74-04588

BENTHIC FAUNA OF A TROPICAL MAN-MADE LAKE (VOLTA LAKE, GHANA 1965-1968),
Makerere Univ., Kampala (Uganda). Dept. of Zoology.
T. Petr.
Arch Hydrobiol. Vol 70, No 4, p 484-533. 1972, Illus.
Identifiers: *Benthic fauna, *Chaoborid, *Chironomids, Ecology, *Ephemeroptera(Nymphs), *Ghana(Volta Lake), Tropical lakes, Invertebrates, Macrophytes.

Quantitative and qualitative changes in the individual taxa of the bottom fauna were followed in the Volta man-made lake over the filling period 1965-1968. The changes in the individual invertebrate taxa during this period are considered in relation to the changes environmental factors, such as oxygen content, substratum, degree of exposure to waves, and establishment of littoral aquatic macrophytes. The ecology of chironomids, ephemeropteran nymphs and chaoborid larvae is discussed in detail.—Copyright 1973, Biological Abstracts, Inc.
W74-04636

THE RELATION BETWEEN PHYTOPLANKTON AND PHOSPHATE IN THE LAKE OF CONSTANCE, (IN GERMAN),
Staatliches Institut fuer Seenforschung und Seenbewirtschaftung, Konstanz (West Germany). Abteilung Max Auerbach-Institut.
For primary bibliographic entry see Field 5C.
W74-04637

ECOLOGICAL CHARACTERISTICS OF GONO-IKE LAKE,
Tokyo Univ. (Japan). Ocean Research Inst.
For primary bibliographic entry see Field 5C.
W74-04638

FISHERY SURVEY CARRIED OUT AT LAKE BORULLUS, A. R. E., IN THE SPRING OF 1971, (IN CZECH),
Ceskoslovenska Akademie Ved, Brno. Ustav pro Vyzkum Obratlovcu.
J. Libosvarsky, S. Lusk, and H. Mohamed El-Sedfy.
Prirodeved Pr Ustavu Cesk Akad Ved Brne. Vol 6, No 7, p 1-41. 1972. Illus.
Identifiers: Atherina-mochon, Cichlids, Clarias-lazera, *Fishery survey, Lakes, Mugil-capito, Mugil-cephalus, Solea-solea, Spring, Survey, Fish catch, *Lake Borullus(A.R.E.), *Nile Delta.

A joint research program was carried out at Lake Borullus, 1 of the coastal lakes of the Nile Delta. Of 29 fish species caught; 6 were marine, 6 were diadromous species, 4 belong to brackish water inhabitants, 12 were Nile fishes and 1 was an introduced species. The catch per unit of effort in the spring was checked both by test fishing and via inspections of bags of commercial fishermen. With trammel nets the catch per unit of effort varied from 2 individuals of fish and 49 g of fish flesh (in daytime settings) to 14 individuals and 235 g (in overnight settings). Trammel net adapted for beach seining yielded 16 individuals and 206 g. The beach seining for fry returned 126 individuals and 210 g of fish/haul. The bodies of 3 spp of grey mullets, Solea solea, Clarias lazera and Atherina mochon, analyzed for dry matter, fat and ash contents and caloric value of 1 g dry matter showed higher nutritive value (over 5000 cal) than the bodies of cichlids (between 4 and 5000 cal). The length distributions in catches supported by scale readings show that, in spring, the population of Mugil cephalus consisted largely of 1 group (the youngs-of-the-year), while the population of M. capito was formed mainly by 2 age groups (the youngs-of-the-year and the age class I). Thus the exploitation was rather heavy and reproduction lay on the first spawning fish. Nevertheless, the large amount of fry of both species found over large areas of the lake indicated that the populations still existed on a sustained basis.--Copyright 1973, Biological Abstracts, Inc.
W74-04643

LITTORAL VEGETATION OVERGROWING IN SOME LAKES OF KALININ DISTRICT, (IN RUSSINA),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
N. Ya. Mironova.
Gidrobiol Zh. Vol 8, No 5, p 14-20. 1972. (English summary).
Identifiers: Lakes, *Littoral, *USSR(Kalinin lakes), *Vegetation overgrowth.

The comparative analysis of the littoral vegetation overgrowing in 9 environmentally different lakes (in USSR) is given. There are outlined 4 lake groups with different types of vegetation, determined by coaction of regulatory factors, such as water transparency, littoral structure, character of the bottom deposits.--Copyright 1973, Biological Abstracts, Inc.
W74-04646

SUBGLACIAL DEVELOPMENT OF CHLORELLA IN BAIKAL, (IN RUSSIAN),
Irkutskii Gosudarstvennyi Universitet (USSR).
G. F. Zagorenko.
Dokl Akad Nauk SSSR Ser Biol. Vol 206, No 5, p 1223-1225. 1972. Illus.
Identifiers: *Chlorella, *Lake Baikal, *Subglacial development, *USSR, Algae.

Chlorella were collected from the subglacial waters of Lake Baikal (USSR) at various depths on March 3, 15, 22, 28, 29, 1971 and 2 24-hr series of samples taken Mar 5-6 and 18-19, 1971. The quantity of Chlorella at various depths varied during the observation period from 20,000 to 190,000 cells/l. Redistribution of the population of Chlorella during the 24-hr period was not observed, and its maximum number of cells was noted at a depth of 10-20 m.--Copyright 1973, Biological Abstracts, Inc.
W74-04647

PHYTOPLANKTON DYNAMICS IN THE SEVERSKIY DONETS RIVER FOR THE FIRST YEARS AFTER ITS REGULATION, (IN RUSSINA),
Kharkov State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W74-04648

DETAILED TIME VARIATIONS IN MEAN TEMPERATURE AND HEAT CONTENT OF SOME MADISON LAKES,
State Univ. of New York, Buffalo. Dept. of Biology.
K. M. Stewart.
Limnology and Oceanography, Vol 18, No 2, p 218-226, March, 1973. 4 fig, 1 tab, 28 ref.

Descriptors: Limnology, *Wisconsin, *Water temperature, Lakes, Climatology, Thermal properties, Lake morphometry, On-site data collections, Seasonal, Fluctuations, Annual, Diurnal, Sampling, Thermal pollution, *Heat budget, Water pollution, Data collections, Equilibrium, *Time series analysis.
Identifiers: *Lake Mendota(Wis), Heat content, *Lake Monona(Wis), *Lake Waubesa(Wis).

Detailed variations in mean temperature and heat content were studied for 5 years in Lake Mendota and 3 years in Lakes Monona, and Waubesa near Madison, Wisconsin. The data show that heat content may vary significantly within 2 or 3 days and that the specific time of maximum heat content is unpredictable. Accurate determinations of heat budgets require frequent sampling over long periods. A Birgean annual heat budget may not necessarily reflect the influence of a lake on the surrounding environment. Thermal discharges had little influence in determining the mean temperatures of Lake Monana. (Jerome-Vanderbilt)
W74-04659

THE THERMAL REGIME OF LAKE LANAO (PHILIPPINES) AND ITS THEORETICAL IMPLICATIONS FOR TROPICAL LAKES,
Indiana Univ., Bloomington. Dept. of Zoology.
W. M. Lewis, Jr.
Limnology and Oceanography, Vol 18, No 2, p 200-217, March 1973, 14 fig, 1 tab, 27 ref.

Descriptors: *Limnology, *Lake morphology, *Thermal stratification, *Water temperature, Lakes, Tropical regions, Climatology, Thermal properties, Thermocline, Seasonal, Turbulence, Mixing, On-site data collections, Analytical techniques, Heat budget, Winds, Hypolimnion, Air temperature.
Identifiers: *Thermal inversion, *Philippines(Lake Lanao).

A study of temperature records, climatic profiles, and chemical data over 14 months for Lake Lanao, a low altitude tropical lake, shows that the annual pattern of heat distribution depends partly on a seasonal air temperature minimum and partly on nonseasonal climatic changes. The lake circulated during January and February at the time of seasonal cooling, was intermittently stable during March and April and was stratified during all other months. During stratification the principal thermocline achieved equilbrium with storm winds at 40-50 m. Secondary and tertiary thermoclines repeatedly split the epilimnion into an upper turbulent layer and a lower stagnant layer for periods of up to 2 months, but were displaced or dissipated at irregular intervals by storms. Changes in the shape of the thermal profile in the lake included sharpening of thermoclines by wind and convection, smearing of thermoclines by internal water movements, unstable thermal inversions due to surface cooling, and stable thermal inversions on the bottom resulting from heat retention during cool months. (Jerome-Vanderbilt)
W74-04665

CHIRONOMIDAE (DIPTERA) FROM THE AREA OF FREIBURG IN BREISGAU (WITH SPECIAL CONSIDERATION OF THE GENUS CHIRONOMUS), (IN GERMAN),
Freiburg Univ. (West Germany).
E. Krieger-Wolff, and W. Wuelker.
Beitr Naturkd Forsch Suedwestdtsch. Vol 30, No 2, p 133-145. 1971. Illus.
Identifiers: Chironomidae, *Chironomus spp, Chironomus-Dorsalis, Chironomus-Luridus, Chironomus-Melanotus, *Diptera, *Germany(Freiburg-im-Breisgraw).

Over 50 chironomid species reported in the literature for southern Black Forest region (West Germany) are listed with author and location of find. Chironomus from the Black Forest and Rhine lowlands (15 spp.), determined by chromosome analysis, are briefly discussed and their localities are listed. C. luridus was most frequent in the pools of the area, followed by C. melanotus. C. dorsalis has adapted to life in temporary waters (puddles) with the ability to withstand dessication. However, a more permanent body of water to serve as a reservoir in case of long drought occurred near each find. With remarkable regularity 3 different Chironomus species were found in equal abundance at the small pools. These species may undergo temporally different population development so that total competition did not occur.--Copyright 1973, Biological Abstracts, Inc.
W74-04678

RELATION BETWEEN THE AMOUNT OF NET ZOOPLANKTON AND THE DEPTH OF STATION IN SHALLOW LIPNO RESERVOIR,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-04680

CHEMICAL ECOLOGY: EVIDENCE FOR PHOSPHATE AS THE ONLY FACTOR LIMITING ALGAL GROWTH IN LAKE KINNERET,
Weizmann Inst. of Science, Rehovoth (Israel). Isotope Dept.
For primary bibliographic entry see Field 5C.
W74-04685

SEX CYCLE, SPAWNING AND FERTILITY OF WEST SIBERIAN CRUCIANS IN THE STEPPE LAKES, (IN RUSSIAN),
Akademiya Nauk SSSR, Novosibirsk. Institut Biologii.
M. V. Volgin, and V. M. Anchutin.
Izv Sib Otd Akad Nauk SSSR Ser Biol Med Nauk. 3: p 102-105. 1972. Illus. (English summary).
Identifiers: *Crucians(Siberian), *Fertility, Growth stages, Lakes, Sex, *Spawning, Survival, *USSR(Steppe lakes), *Fish reproduction.

The west Siberian golden and silver crucians spawn once in spite of having 4 generations of ovules in their ovary. It is an adaptation of crucians to the complex conditions in the west Siberian lakes(USSR). Fertility of crucians is not high. The golden crucians have higher fertility than the silver one, but silver crucians grow and survive better.--Copyright 1973, Biological Abstracts, Inc.
W74-04689

THE FEEDING OF PELECUS CULTRATUS L. IN KAIRAKKUM RESERVOIR, (IN RUSSIAN),
Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.
L. V. Kondur.
Dokl Akad Nauk Tadzh SSR. Vol 15, No 9, p 60-63. 1972. Illus.
Identifiers: *Feeding habits, *Pelecus-Cultratus, Reservoirs, Seasonal, *USSR(Kairakkum reservoir).

The feeding habits of Pelecus cultratus (in Kairakkum Reservoir, USSR) were studied at various stages of development. The intestines of 99 fish of 21-33.5 cm length, 38 of which were found to be empty, were examined. Seasonal increments were noted together with characteristic changes in the feeding content.--Copyright 1973, Biological Abstracts, Inc.
W74-04695

MORPHOLOGICAL VARIATION OF KERATELLA COCHLEARIS (GOSSE) (ROTATORIA) IN SEVERAL MASURIAN LAKES OF DIFFERENT TROPHIC LEVEL,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W74-04696

HETEROTROPHIC UTILIZATION OF SUCROSE IN AN ARTIFICIALLY ENRICHED LAKE,
Manitoba Univ., Winnipeg. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W74-04781

MEASUREMENT OF ADENOSINE TRIPHOSPHATE (ATP) IN TWO PRECAMBRIAN SHIELD LAKES OF NORTHWESTERN ONTARIO,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5B.
W74-04782

MOVEMENTS OF PHOSPHORUS BETWEEN ITS BIOLOGICALLY IMPORTANT FORMS IN LAKE WATER,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
For primary bibliographic entry see Field 5B.
W74-04783

DIURNAL VARIATION OF DISSOLVED INORGANIC CARBON AND ITS USE IN ESTIMATING PRIMARY PRODUCTION AND CO2 INVASION IN LAKE 227,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W74-04784

DISTRIBUTION AND UPTAKE OF ARTIFICIALLY INTRODUCED RADIUM-226 IN A SMALL LAKE,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 5B.
W74-04785

A NUMERICAL MODEL FOR DETERMINING INTEGRAL PRIMARY PRODUCTION AND ITS APPLICATION TO LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 5C.
W74-04786

PRODUCTION OF EPILITHIPHYTON IN TWO LAKES OF THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W74-04787

EUTROPHICATION OF LAKE 227 BY ADDITION OF PHOSPHATE AND NITRATE: THE SECOND, THIRD, AND FOURTH YEARS OF ENRICHMENT, 1970, 1971, AND 1972,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W74-04789

A REPORT ON THE LIMNOLOGY OF MONROE RESERVOIR, INDIANA,
Indiana Univ., Bloomington. School of Public and Environmental Affairs.
B. R. Allanson, C. J. Zimmerman, and D. K. Smith.
Occasional Papers, No 1, January 1973. 53 p, 12 fig, 15 tab, 18 ref.

Descriptors: *Limnology, *Reservoirs, *Indiana, Water quality, Water analysis, Physicochemical properties, Lake morphology, Aquatic life, Ecosystems, Water temperature, Biological properties, Data collections, Reviews, Water quality control, Water utilization.
Identifiers: *Monroe Reservoir(Ind).

Monroe Reservoir was established in Indiana in 1964-65 by damming the flow of Salt Creek, resulting in the biggest manmade lake in Indiana. It has become an important recreation center for the State, quite apart from its resource as a water supply for the town of Bloomington and associated industry. Because of its obvious importance to the State, the reservoir should be retained in as acceptable condition as possible. To accomplish this, much serious effort by all the users, both private and state, will be required to carry out an effective program of water quality control. To provide a basis for future comparisons, all existing knowledge about the limnology of the reservoir, including some new information, is presented. Data tabulated or illustrated include sampling sites, temperature profiles, oxygen profiles, lake bottom profiles, specific conductance, hydrogen ion concentrations, phosphorus content, nitrogen content, eutrophication, zooplankton densities, and bacterial populations. During 1968 and 1971, maximum Secchi disc transparencies occurred in late August-early September in both years. Transparency also increased toward the dam during 1971 and was lowest in the North and Middle Forks. (Woodard-USGS)
W74-04792

VERIFICATION OF WATER TEMPERATURE FORECASTS FOR DEEP, STRATIFIED RESERVOIRS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 4A.
W74-04807

HORIZONTAL DISTRIBUTION OF SOME CHEMICAL AND PHYSICAL CHARACTERISTICS IN LIPNO RESERVOIR,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-04814

COMPARATIVE STUDY, IN 1966 AND 1967, OF THREE RESERVOIRS IN THE PROJECT OF A NATURAL PARK IN THE MORVAN REGION (IN FRENCH),
Institut National de la Recherche Agronomique, Thonon-les-Bains (France). Station d'Hydrobiologie Lacustre.
For primary bibliographic entry see Field 5C.
W74-04815

MICRO- AND MESOBENTHOS DEVELOPMENT AS A FACTOR OF SOIL COMPOSITION (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
V. V. Gurvich, E. P. Nakhshina, and I. K. Palamarchuk.
Gidrobiol Zh. 8(4): p 27-34, Illus, 1972, English summary.
Identifiers: *Benthos, Minerals, *Organic matter, *Soils, *USSR(Kakhovka reservoir), Zinc, Copper, Cobalt, Manganese.

Observations in the Kakhovka reservoir, USSR, showed the dependence of micro- and mesobenthic organism development on soil composition organic matter and microelement (Mn, Zn, Cu, Co) contents.--Copyright 1973, Biological Abstracts, Inc.
W74-04816

ECOLOGY AND BIOCOENOLOGY OF LAGUNAS OR LAKES OF THIRD ORDER OF THE TEMPERATE NEOTROPICAL REGION (SOUTHEAST PAMPASIC REGION OF ARGENTINA), (IN SPANISH),
La Plata Univ. (Argentina). Instituto de Limnologia.
R. A. Ringuelet.
Physis (B Aires). 31(82): p 55-76, 1972, English summary.
Identifiers: Algae, *Argentina(Pampasic region), *Biocenology, Crustaceans, *Ecology, Fish, Genetics, Hydrochemistry, Hydrophytes, Lagunas, Lakes, Neotropical regions, Plankton, Rotifers, Temperate, Thermal stress.

A great program of limnological research was initiated in 1965 concerning 25 lagunas of the Southeast Pampasic region of Argentina. A definition of terms is followed by an explanation of genetic processes and a summary of geomorphic characteristics and the thermal budget. Hydrochemically the 'lagunas' are classified according to their salinity and ionic composition, recalling the most marked annual fluctuations. Information about phytoplankton and zooplankton, with numerical data is presented. The plankton is an 'Eulimnoplankton,' frequently with adventitious elements; the zooplankton is dominated by nauplii or ritifers; the annual variations show 2 peaks, in autumn and in spring; the winter minimum is moderated and ecological factors permit the reproduction of algae and animals. There are 2 plankton types, oligohaline and mesohaline, with rotifers and microcrustacean indictors. An account of the mesofauna from euplenston, bafon and benthos is given, as well as data on hydrophytes, numerosity and biomass. Population studies on fishes reveal that a typical 'laguna,' such as Chascomus, has 16 spp., each computed in numbers and biomasses. The silverside of 'pejerrey' has a strict relation with size of microcrustaceans of the plankton, and the yield of planktonic fishes of 'lagunas' varies accordingly. There are 2 general types of 'lagunas,' characterized by their chemical composition, hydrophytes and plankton, whose successions are very different (halitrophic and saprotrophic types) in relation with the regional climatic factors.--Copyright 1973, Biological Abstracts, Inc.
W74-04817

RATIO OF ORGANIC CARBON WITH DIFFERENT TYPES OF OXIDIZABILITY IN THE OPEN WATER OF BAIKAL (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W74-04819

DISTRIBUTION OF ORGANIC MATTER AND BACTERIA IN THE UPPER LAYER OF BOTTOM DEPOSIT OF LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 5B.
W74-04839

WAVE INTERACTION AND LANGMUIR CIRCULATIONS,
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
In: Physical Studies on Lake George and Lake Ontario, Lake George Studies Report No 6: State University of New York Atmospheric Sciences Research Center Publication No 147, p 496-499, June 1971. 2 fig, 15 ref. (Reprinted from Proc of 11th Conference on Great Lakes Research, 1968.).

Descriptors: *Currents(Water), *Waves(Water), *Limnology, Lakes, Water circulation, Refraction(Water waves).
Identifiers: *Langmuir circulation, *Waves interference(Water).

The interaction of two trochoidal wave trains was examined numerically to compare the computed wave shapes and locations to the observation of streaking associated with Langmuir circulations. The wave trains approach each other at angles of 15, 20 and 25 deg. The resulting areas of maximum amplitude form apparent streaks and move across the field of vision, similar to the motion of streaks associated with Langmuir circulations. (Knapp-USGS)
W74-04844

A FIELD STUDY OF LANGMUIR CIRCULATIONS,
State Univ. of New York, Albany.
G. E. Myer.
In: Physical Studies on Lake George and Lake Ontario: Lake George Studies Report No 6: State University of New York Atmospheric Sciences Research Center Publication No 147, p 652-663, June 1971. 11 fig, 1 tab, 21 ref. (Reprinted from Proc of 12th Conference on Great Lakes Research, 1969).

Descriptors: *Waves(Water), *Currents(Water), *Water circulation, Lakes, Limnology, Winds, *New York.
Identifiers: *Langmuir circulation, *Lake George(NY).

Under thermally stable conditions Langmuir circulations transport heat downward. Langmuir circulations are a major cause of epilimnion mixing and thermocline development and decline in lakes. The Langmuir circulations appear to be coupled to the wind by some indirect mechanism. The mechanisms for this coupling which best fit field observations on Lake George, New York, are those acting as or very near the water surface. (Knapp-USGS)
W74-04845

2I. Water In Plants

CHANGES IN ENZYMES IN THE PLANT AS RELATED TO WATER SUPPLY AND USAGE,
California Univ., Davis. Dept. of Water Science and Engineering.
T. C. Hsiao, and R. C. Huffaker.
Available from National Technical Information Service as PB-228 634, $4.00 in paper copy. Completion Report, UCAL-WRC-70-W131, March, 1970. 8 p, 14 ref. OWRR B-029-CAL(1).

Descriptors: *Enzymes, *Metabolism, Photsynthesis, Nitrogen, *Drought resistance, *Stomata, *Moisture stress, Plant physiology.
Identifiers: Starch degradation.

The ultimate objective is to determine the mechanisms or controlling factors which regulate the adaption of plants to conditions where water is limiting. The immediate objectives have been (1) to determine the effects of water deficit on enzymes required for the important biochemical processes of nitrogen metabolism, photosynthesis, and starch degradation; (2) to relate changes in these processes caused by water stress to the growth of the plant and to its adaptation to drought; and (3) to study the control governing the opening and closing of stomata, the pores which regulate water loss from plants.
W74-04306

CONCERNING LARGE-SCALE CULTIVATION OF THERMOPHILIC COSMOPOLITAN MASTIGOCLADUS LAMINOUSUS COHN (CYANOPHYTA) IN ICELANDIC HOT SPRINGS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Institut fuer Molekularbiologie und Biophysik.
A. Binder, P. Locher, and H. Zuber.
Arch Hydrobiol. Vol 70, No 4, p 451-555, 1972. Illus. English summary.
Identifiers: Chemistry, Cultivation, *Cyanophyta, Flow, *Iceland, *Mastigocladus-Laminosus, Temperature, *Thermophilic animals, *Algae, Hydrogen ion concentration, Hot Springs.

M. laminosus Cohn was found in great quantities in several Icelandic hot springs. The effects of pH, temperature, chemical composition and flow-speed of the water on growth of the organism were studied, and the optimum conditions for cultivation were determined. Based on these results a 5 m long flow-through channel was built in which to cultivate the algae.--Copyright 1973, Biological Abstracts, Inc.
W74-04486

INFLUENCE OF ENVIRONMENTAL MOISTURE CONDITIONS ON THE PHENOL COMPOUND AMOUNT IN CALLUNA VULGARIS L.,
J. Brachet, and N. Bichaut.
C R Hebd Seances Acad Sci Ser D Sci Nat. Vol 275, No 19, p 2137-2139, 1972. Illus.
Identifiers: *Calluna-Vulgaris, Environmental studies, *Phenol compound, *Soil moisture depletion.

The studies focused on the effect of moisture deprivation on the level of soluble phenol compounds in 2 lots of C. vulgaris L., adapted to moisture obtained by growing under controlled conditions. The simultaneous action to the atmospheric and edaphic moisture deprivation produces an increase in synthesis rate, more significant and earlier in the plant previously grown in a moist atmosphere.--Copyright 1973, Biological Abstracts, Inc.
W74-04487

SCANNING ELECTRON MICROSCOPY OF FIXED, FROZEN, AND DRIED PROTOZOA,
Illinois Univ., Urbana. Dept. of Zoology.
For primary bibliographic entry see Field 7B.
W74-04497

PLANT RESPONSES TO WATER STRESS,
California Univ., Davis. Lab. of Plant-Water Relations.
T. C. Hsiao.
Annual Review of Plant Physiology, Vol 24, p 519-570, 1973. 330 ref.

Descriptors: *Reviews, *Bibliographies, *Plant physiology, *Water requirements, *Moisture stress, Agronomy, *Soil-Water-Plant relationships, Plant pathology, Plant growth, Photosynthesis, Carbon dioxide, Metabolism, Nitrogen compounds, Cytological studies, Plant tissues, Plant growth substances, Enzymes, Respiration, Transpiration, Translocation.
Identifiers: Cell walls.

Based largely upon the literature published during the past decade, this review deals with current knowledge (and lack of knowledge) concerning parameters that indicate the status of water in plants, observed physiological and biochemical responses to water stress, and mechanisms underlying such responses as transpiration, carbon dioxide assimilation, respiration, cell growth, cell wall synthesis, cell division, hormonal activity, enzyme levels, nitrogen metabolism, ion transport, and photosynthate translocation. (Brown-IPC)
W74-04539

WATER IN WOOD,
State Univ. of New York, Syracuse. Coll. of Forestry.
C. Skaar.
Syracuse University Press, Syracuse, New York, 1972, 218 p, 185 ref. Price: $12.50.

Descriptors: *Lumber, *Moisture content, *Moisture uptake, *Vascular tissues, *Humidity, *Hygroscopic water, Vapor pressure, Thermodynamics, Thermodynamic behavior, Water properties, Water types, Moisture tension, Water vapor, Absorption, Adsorption, Capillary water, Porosity, Permeability, Evaporation, Osmotic pressure.
Identifiers: *Wood, Moisture equilibria, Dimensional stability, Swelling.

This fundamental text on wood-water relationships provides a unified theoretical treatment of all important physical phenomena relating to te behavior of wood in response to changes in moisture content. The five chapters deal with the following topics: Physics of water (vapor pressure, capillary and osmotic pressure, evaporation, freezing, sublimation, etc.); Wood moisture and the environment (hydrogen bonding, water sorption, moisture content and measurement, processing effect on wood moisture, etc.); Hygroscopic shrinkage and swelling (dimensional stability, anisotropy, etc.); Thermodynamics of moisture sorption (heats of sorption and of wetting, swelling pressure, thermo- and hygroelasticities, etc.); and Theories of water sorption proposed by various researchers to explain the equilibrium moisture content of wood in relation to atmospheric conditions. A subject index is appended. (Brown-IPC)
W74-04545

OBSERVATIONS ON THE VEGETATION OF THE KORONOWO RESERVOIR,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.
K. Kepczynski, and M. Ceynowa-Gieldon.
Stud Soc Sci Torun Sect D (Bot). Vol 9, No 4, p 1-68. 1972. Illus.
Identifiers: Alder, Bidens-cernuus, Bidens-connatus, Bidens-melanocarpus, Ceratophyllum-demersum, Ceratophyllum-submersum, Elodea-canadensis, Flooding, Heleocharis-palustris, *Poland(Koronowo reservoir), Potamogeton-natans, Reservoirs, *Succession(Plants), *Swamps, *Vegetation.

The occurrence and succession of plants in the Koronowo reservoir area (Poland) after the construction of the dam on the Brda River in 1959 was observed. The initial flooding produced numerous small pools in nearby forests, meadows and cultivated fields. Shortly after the flooding, floating islands occurred in the reservoir which were the result of loosening of the flooded peat bogs, alder swamps and lowland forests. The plants of these islands made up the major source of distribution of swamp, reed and bush plants. The major pools

were first settled by water plants, so that in the first yr after construction of the dam Elodea canadensis, Ceratophyllum demersum, C. submersum, Potamogeton natans and other water plants previously only known to occur in the Brda River bed were observed in these pools. On the banks of the reservoir first swamp vegetation, then after some years, reeds occurred. In the isolated small pools in the forests, swamp plants, most significantly Bidens cernuus, appeared first, followed by reeds and aquatic plants. Present vegetation is species-poor spotty. Typical plant associations were lacking in the reservoir; most of the present stands have transitional character. A total 558 spp. were collected in the reservoir and on its banks. B. connatus and B. melanocarpus were first found in this area after construction of the dam. The most important associations of the reservoir area are at present the Myriophyllo-Nupharetum in its initial stage, the Sagittario-Sparaganietum, Scirpo-Phragmitetum and Glycerietum aquaticae and stands containing P. natans, Heleocharis palustris and B. cernuus.--Copyright 1973, Biological Abstracts, Inc.
W74-04654

WATER WITHDRAWAL BY PLANT ROOTS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 3F.
W74-04655

DAILY DIET AND RATE OF FEEDING OF NOTOTHENIA ROSSI MARMORATA FISCHER AND DISSOSTICHUS ELEGINOIDES SMITT, FAMILY NOTOTHENIDAE, IN THE AREA OF SOUTHERN GEORGIA (USSR), (IN RUSSIAN),
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
M. I. Tarverdieva.
Vopr Ikhtiol. Vol 12, No 4, p 748-756. 1972. Illus.
Identifiers: Ctenophora, *Daily diet, *Dissostichus-Eleginoides, Euphausia-Superba, Fish, *Notothenia-Rossi-Marmorata, Nototheniidae, *USSR(Georgia), Feeding rate.

In March 1971, the basic food of N. rossi marmorata was Ctenophora, that of D. eleginoides was fish. During this period, feeding increased during the second half of the day and decreased in the morning. N. rossi consumed intensively for 15 hr, D. eleginoides for 19 hr with breaks of 13 and 10 hr, respectively. In May, when N. rossi consumed Euphausia superba, feeding increased at about 11:00 a.m. and decreased at about 4:00 p.m. The daily ration was computed by 2 methods.--Copyright 1973, Biological Abstracts, Inc.
W74-04679

CONTRIBUTION TO KNOWLEDGE ABOUT THE LEAF ANATOMY OF SPECIES OF A 'CAATINGA' OF THE RIO NEGRO (AMAZON), (IN PORTUGUESE),
Sao Paulo Univ. (Brazil). Inst. of Bio-Sciences.
B. L. DeMorretes, and M. G. Ferri.
Rek Biol (Lisb). Vol 8, No 1-4, p 97-122. 1972. Illus. (English summary).
Identifiers: *Amazon region(Rio Negro), Bactris-cuspidata, *Caatinga, Clusia-spathulaefolia, Compsoneura-debilis, *Leaf, Oligotrophic, Pagamea-coriacea, Retiniphyllum-truncatum, Scleromorpism, Sphaeradenia-amazonica, *Evergreen scrubs.

A 'caatinga' is a type of low scrubby evergreen forest on local areas of white sand. Species treated are Bactris cuspidata Mart., Clusia spathulaefolia Engl., Compsoneura debilis Warb., Pagamea coriacea Spruce, Retiniphyllum truncatum Mull. Arg. and Sphaeradenia amazonica Harling. The yearly rainfall in the region may be more than 4000 mm and there is hardly a month with less than 100 mm. Average temperatures and relative humidity are high. Soils are generally very sandy and poor. Several structures that are usually considered xeromorphic features are described: thick cuticle and cuticular layers, water-storing tissues, stomates in depressions, mechanical tissues, etc. The idea of oligotrophic scleromorphism presented by several authors in connection with other types of vegetation, such as the 'cerrado' which grows in places where soil water is not lacking but the soils are also in general very poor, is supported.--Copyright 1973, Biological Abstracts, Inc.
W74-04682

BOG VEGETATION RE-MAPPED AFTER SIXTY YEARS: STUDIES ON SKAGERSHULTAMOSSEN, CENTRAL SWEDEN,
I. Backeus.
Oikos. Vol 23, No 3, p 384-393. 1972. Illus.
Identifiers: *Bogs, *Sweden(Skagershultamossen), *Vegetation, Mapping.

Two areas were mapped. The new maps were compared with maps of the same areas from 1910, made by L. von Post. The vegetation changes are small. The open water surfaces have diminished in number and extent. The theory of cyclic succession on peat bogs finds no support from the maps. Plant communities have been delimited to correspond to those on the old maps and defined through analysis of a number of sample plots.--Copyright 1973, Biological Abstracts, Inc.
W74-04683

AEDES AEGYPTI AND AEDES SIMPSONI BREEDING IN CORAL ROCK HOLES ON THE COAST OF TANZANIA,
World Health Organization, Dar es Salaam (Tanzania). East African Aedes Research Unit.
M. Trpis, W. K. Hartberg, C. Teesdale, and G. A. H. McClelland.
Bull W H O. Vol 45, No 4, p 529-531. 1971.
Identifiers: *Aedes-aegypti, *Aedes-simpsoni, *Africa(Tanzania), Axils, Banana, Breeding, Coast, Coconut, Colocasia, Coral, Holes, Pineapple, Rock, Sheels, Snail, Tree.

Breeding sites of A. aegypti in East Africa can be generally divided into 2 groups: breeding places associated with man, i.e., indoor and outdoor breeding in artificial containers (water-pots, discarded tins, tires, bottles, barrels, buckets, glass jars, etc); and natural breeding places (tree holes, coconut shells, snail shells, sometimes plant axils, and rock holes). Wiseman et al. (1939) recorded A. aegypti breeding holes in coral on the Kenya coast near Mombasa. Since the East African coast is relatively uniform, it is probable that these holes were identical to those observed during the present study. An extensive survey of the coast would probably indicate that A. aegypti breed wherever there are elevated coral outcorps. In view of the abundance of both A. aegypti and A. simpsoni on the uninhabitad Bongoyo Island, those on Msasani peninsula should probably be regarded as relict forest populations rather than indicating any invasion of an uncharacteristic habitat. A. simpsoni is generally regarded as a species that breeds in the leaf axils of plants. The present work in Tanzania indicates that the breeding sites of A. simpsoni are pineapple axils, colocasia, certain bananas, tree holes, coral holes, and snail shells, in order of preference. A. simpsoni is also known to breed frequently in manmade containers in South Africa (Muspratt, 1965). The coral rock holes on the Msasani peninsula near Dar es Salaam, Tanzania, are considered to be the newly-recorded breeding sites of A. simpsoni.--Copyright 1973, Biological Abstracts, Inc.
W74-04697

THE PHYTOPLANKTON PRODUCTIVITY IN THE PYASINA RIVER NEAR TAREYA VILLAGE (WESTERN TAIMYR), (IN RUSSIAN),
Akademiya Nauk SSSR, Novosibirsk.
V. I. Ermolaev.
Gidrobiol Zh. Vol 8, No 6, p 97-100. 1972.
Identifiers: *Asterionella-formosa, Melosira, *Phytoplankton, *Productivity, Pyasina river, *USSR(Taimyr).

The productivity of phytoplankton in the Pyasina river near Tareya village (USSR) was studied. Samples of water were filtered through no 6 filter paper and subjected to quantitative tests of the intensity of plankton photosynthesis in phials with oxygenation modification. The quantity of algae reached 1.5 mill kl/l of water, bomass 1.017 mg/l and photosynthetic intensity 0.56 mgO2/l day. Fifty species were found of which Asterionella formosa Hass and species of Melosira were most common.--Copyright 1973, Biological Abstracts, Inc.
W74-04698

CHANGES IN THE AVIFAUNA OF THE BIESBOSCH IN THE 1ST YR AFTER THE ELIMINATION OF THE TIDE,
D. Fey, and T. Lebret.
Limosa. Vol 45, No 3/4, p 101-118. 1972. Illus. (English summary).
Identifiers: *Avi fauna, Bluethroat, Breeding, Coot, Crested, Cyanosylvia-suecica, Fulica-atra, Grebe, *Netherlands(Biesbosch), Panurus-biarmicus, Platalea-leucoradia, Podiceps-cristatus, Reeds, Sluices, Spoonbill, Teal, *Tideal mud flats.

Until Nov. 1970 the Biesbosch, Netherlands, was a freshwater tidal delta area. The Rhine and Meuse rivers meet here. The area is 32 km southeast of Rotterdam. The tidal amplitude was some 2 m. In Nov., 1970 a system of sluices was put into action, and the tidal span was reduced to 0.20 m. The high level of the new situation is 0.60 m below the original high tide level. Some 65-75% of the former tidal mud flat is permanently water covered now. Changes in the vegetation and in numbers of bird species are described. Teal (Anas crecca) numbered 10,000-15,000 birds in former days. Their numbers were greatly reduced after elimination of the tide. The great crested grebe (Podiceps cristatus) has started to breed. Spoon-bills (Platalea leucorodia) are present in considerable numbers. Coots (Fulica atra) increased as breeding birds. They reduced the extension of the reeds, which eventually may be a positive factor. Low nestling species bluethroat (Cyanosylvia svecica) and bearded tit (Panurus biarmicus) increased in the former tidal reed beds, but soon will lose their habitat because the reed beds are permanently dry and will develop into scrub.--Copyright 1973, Biological Abstracts, Inc.
W74-04699

SYNGNATHUS NIGROLINEATUS NIGROLINEATUS (EICHWALD) IN THE FRASINET RIVER AND MOSTISTEA LAKE, (IN RUMANIAN),
R. Giurca, and M. Olaru.
Bul Cercet Piscic. Vol 31, No 1/2, p 91-93. 1972. Illus. (English summary).
Identifiers: Frasinet, Lakes, Mostistea, Parasites, Records, *Reproduction, River, *Romania, Syngnathus-nigrolineatus-nigrolineatus, *Lophobtanchiate, Fish foods.

Occurrence was noted, for the first time, in the lake Mostistea and the river Frasinet (Romania) of the lophobtanchiate S. nigrolineatus nigrolineatus. Some biometrical and general data are presented. The average length was 134 mm for males and 125 mm for females; average weight 2 g; number of eggs laid in the male's hatching purse 100; the eggs diameter 1.5-1.7 mm. Some aspects related to food and the parasites of the fish, in the environmental conditions of the respective ecosystems are discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-04700

SOME NEW DATA CONCERNING ZIZANIA LATIFOLIA (GRISOB.) STAPF AND ITS

RESOURCES IN THE FLOOD PLAINS OF LOWER AMUR,
V. S. Shaga, and N. I. Shaga.
Rast Resur. Vol 8, No 1, p 122-126. 1972.
Identifiers: Floodplains, *Forage plants, Medicinal properties, *USSR(Amur floodplains), *Zizania-Latifolia, *Vegetation.

An effective method for propagation by means of shoots that develop from rhizotome buds was developed for this promising forage plant. This plant has medicinal properties.--Copyright 1973, Biological Abstracts, Inc.
W74-04703

VERTICAL DISTRIBUTION OF ZOOBENTHOS OF THE MOUNTAIN RIVER OF ADZHAR ASSR (IN RUSSIAN),
Tbilisskii Gosudarstvennyi Universitet (USSR).
R. S. Zosidze.
Soobshch Akad Nauk Gruz SSR. 68(2): p 461-463, 1972, English summary.
Identifiers: *Benthos, *Distribution(Vertical), Mountain rivers, *USSR(Adzhar ASSR), *Zooplankton.

Investigations have shown that the qualitative and quantitative composition of zoobenthos in some mountain rivers of Adzhar, ASSR, USSR increases upstream. This is assumed to be a natural phenomenon for mountain rivers.--Copyright 1973, Biological Abstracts, Inc.
W74-04818

TYPES OF DISTRIBUTION PATTERN AMONG FRESHWATER ANIMALS, (IN RUMANIAN),
Academia R. S. R., Bucharest (Rumania). Institutul de Biologie.
P. Banarescu.
Rev Roum Biol Ser Zool. 17(1): p 23-30. 1972.
Identifiers: Anostraca, Crustacea, *Distribution patterns, Fish, Insects, Mites, Mollusks, *Aquatic animals.

The main types of distribution pattern recognized among epigeous fresh-water animals are: primary aquatic animals (fishes, higher crustaceans, mollusks) whose ranges depend mainly on river drainages; inhabitants of temporary pools with restricted range (the most important group being the Anostraca) whose ranges depend on climatic zones; insects and water mites, of terrestrial origin; the range of the rheophilic ones depend mainly on mountain ranges. Many hypogeous animals, both of marine and of fresh-water origin, seem to have retained the range of colonization of subterranean waters, in spite of the old age of many of them.--Copyright 1973, Biological Abstracts, Inc.
W74-04840

2J. Erosion and Sedimentation

GROWTH OF LONGSHORE CURRENTS DOWNSTREAM OF A SURF-ZONE BARRIER,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
P. S. Eagleson.
In: Coastal Engineering Santa Barbara Specialty Conference, American Society of Civil Engineers, October 1965, Chap 20, p 487-507, 1966. 6 fig, 9 ref. DA-49-005-CIV-ENG-62-9.

Descriptors: *Sediment transport, *Beaches, Coasts, Model studies, *Currents(Water), *Waves(Water), Equations.
Identifiers: Longshore currents, Surf zone, Momentum flux.

Momentum flux considerations are used to formulate a differential equation governing the growth, with distance, of the mean longshore current velocity in the surf-zone on a plane, impermeable beach due to monochromatic waves. The equation is solved for the flow situation downstream of a surf-zone barrier and is shown to compare favorably with laboratory measurements. The asymptotic (uniform flow) form of the relation is also shown to be in good agreement with the field and laboratory data of other investigators. Conclusions are reached governing the size of laboratory models necessary to represent conditions of fully developed longshore currents. A thorough understanding of the mechanics of sand transportation parallel to coasts must ultimately be based upon detailed knowledge of the complicated fluid motions which occur within the surf zone. This work is devoted to the formulation and evaluation of a rational analytical model for the prediction of mean longshore current velocity as a function of beach and wave parameters. (Sinha-OEIS)
W74-04324

MEAN DIRECTION OF WAVES AND OF WAVE ENERGY,
Leeds, Hill and Jewett Inc., Los Angeles, Calif.
O. J. Lillevang.
Journal of the Waterways and Harbors Division, American Society of Civil Engineers, Vol 86, No WW1, Proceedings paper No. 2423, p 123-143, March 1960. 11 fig, 2 tab.

Descriptors: *California, *Coasts, *Beach erosion, Harbors, Waves(Water), *Coastal structures, *Beaches, Shoals, *Refraction(Water waves), Breakwaters.
Identifiers: *Shoaling, *Wave energy, Santa Barbara(Calif.).

Reliable predictions of erosion/accretion effects of new coastal works are necessary. A vector technique related to wave direction and duration statistics is devised, tested on Santa Barbara historical shoaling records and demonstrated as a design aid for a small craft harbor plan on a sandy reach of California coast. The configurations of sand deposits which occur as the result of wave action, or because of the interception of wave action, must be related to the direction of wave motion at the locality. Waves expend work which is applied in the direction of the motion of water particles within the waves. It is hypothesized that in mature shoals and beaches their outline will bear a distinguishable relationship to the mean direction of all wave energy which has been applied at that location. If this hypothesis is acceptable, the first need becomes a consistently reproducible definition of the mean direction of wave energy at a specific location from basic data. (Sinha-OEIS)
W74-04328

THE RELATIONSHIP BETWEEN WAVE ACTION AND BEACH PROFILE CHARACTERISTICS,
University Coll., London (England). Dept. of Civil Engineering.
P. H. Kemp.
In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, the Engineering Foundation, Vol 1, Chap 14, p 262-277, 1961. 5 fig, 12 ref.

Descriptors: *Hydraulic models, *Sediment transport, Beaches, Profiles, Particle size, *Beach erosion, *Waves(Water), *Shore protection, Profiles, Sands.
Identifiers: Breakers, Wave action, Beach cusps, Wave steepness, Phase difference, Shingle.

The results of a series of preliminary hydraulic model experiments carried out prior to a model study of the behavior of groynes in stabilizing beaches are described. Most of the beach materials used represented coarse sand or shingle in nature. The results demonstrate the fundamental importance of the 'phase-difference' in terms of wave period between the break-point and the limit of uprush, in relation to flow conditions, cusp formation, and the change from 'step' to 'bar' profiles. Within the limits of the experiments an expression connecting the breaker height, beach profile length, and grain diameter is developed, and its implications examined in relation to beach slope, and to the previous 'wave steepness' criterion for the change from step to bar type profiles. Observations are included on the rate of recession of a shoreline due to the onset of more severe wave conditions. (Sinha-OEIS)
W74-04331

LITTORAL TRANSPORT IN THE GREAT LAKES,
United States Lake Survey, Detroit, Mich.
L. Bajorunas.
In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, the Engineering Foundation, Vol 1, Chap 20, p 326-341, 1961. 12 fig, 1 tab, 8 ref.

Descriptors: *Littoral drift, *Sediment transport, *Great Lakes, *Waves(Water), *Beach erosion, Equations, *Currents(Water), Lakes.
Identifiers: Wave energy, Littoral processes.

Littoral transport has been defined as the movement of material along the shore in the littoral zone by waves and currents. The material thus transported is referred to as the littoral drift. The littoral drift originates from the beach material being picked up by the water and transported along the shore and deposited in another location. Shore erosion, littoral transport, and deposition of drift are all factors in the littoral process. An analysis is presented of the littoral transport in the Great Lakes. A derivation of the transport equation and observational data on specific localities also are presented. Wave energy is the prime factor of littoral transport. The general circulatory currents and the currents resulting from water level disturbances do not significantly change the picture of the energy in the littoral zone of the Great Lakes. These currents might be a factor in some isolated or restricted areas. (Sinha-OEIS)
W74-04334

WAVE EFFECT ON THE COAST FORMATION AND EROSION,
Construction Engineering Inst., Warsaw (Poland).
W. Jarocki.
In Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, the Engineering Foundation, Vol 1, Chap 12, p 203-210, 1961. 6 fig, 4 ref.

Descriptors: Suspended load, Bottom sediment, Littoral, Coasts, *Beach erosion, Deposition(Sediments), *Waves(Water), *Tidal effects, Currents(Water), Measurement, *Shallow water, Instrumentation, *Sediment transport.
Identifiers: Nearshore, *Wind waves, Wave action.

Findings are summarized on the kind of sediment moved by waves, the effect of water depth on that movement, and factors of wave action in erosion and accretion of the coast. Information is given on instruments used in field and laboratory studies of sediments and their measurement. (Sinha-OEIS)
W74-04335

THEORETICAL FORMS OF SHORELINES,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
W. Grijm.
In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, the Engineering Foundation, Vol 1, Chap 11, p 197-202, 1961. 5 fig, 3 ref.

Descriptors: *Shores, Coasts, Rivers, *Waves(Water), Equations, Mathematics, *Littoral, *Sediment transport.

Identifiers: *Shorelines, Littoral transport.

The mathematical treatment of factors involved in littoral processes is discussed. Conditions are idealized as littoral transport by waves only, unvarying wave characteristics, and a simple relation between the angle of wave approach and the littoral transport. Also important is the consideration of the quantity of material transported by the river to the sea. (Sinha-OEIS)
W74-04336

MECHANICAL BYPASSING OF LITTORAL DRIFT AT INLETS,
Corps of Engineers, Washington, D.C. Beach Erosion Board.
For primary bibliographic entry see Field 2L.
W74-04337

SEDIMENT MOVEMENT AT INDIAN PORTS,
Birla Inst. of Tech., Ranchi (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W74-04345

POSTGLACIAL PERMAFROST FEATURES IN EASTERN CANADA,
Laval Univ., Quebec.
For primary bibliographic entry see Field 2C.
W74-04358

THE OCCURRENCE AND CHARACTERISTICS OF NEARSHORE PERMAFROST, NORTHERN ALASKA,
For primary bibliographic entry see Field 2C.
W74-04359

STRATIGRAPHY AND DIAGENESIS OF PERENNIALLY FROZEN SEDIMENTS IN THE BARROW, ALASKA, REGION,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04365

RATES OF MASS WASTING IN THE RUBY RANGE, YUKON TERRITORY,
Portland State Univ., Oreg.
L. W. Price.
In: International Conference on Permafrost, Yakutsk, USSR, 1973. p 235-245, 1973. 9 fig, 3 tab, 17 ref.

Descriptors: *Mass wasting, *Solifluction, *Erosion rates, *Degradation(Slope), Permafrost, Arctic, *Canada, Soil erosion, Slopes.
Identifiers: *Ruby Mountains(Canada).

Measurements of mass wasting were carried out during the summers of 1967, 1968 and 1972 in the Ruby Range, Yukon Territory, Canada. The rates of mass wasting in the Ruby Range are in general 1-3 cm per yr less than those recorded for other solifluctional areas. The lower rates in the Ruby Range may be partially due to the fact that many of the measurements were made on large solifluctional terraces with a complete vegetation cover, whereas many of the measurements from other areas were made on individual lobes. (See also W74-04346) (knapp-USGS)
W74-04371

DYNAMICS AND MORPHOLOGY OF SEA COASTS.
National Science Foundation, Washington, D.C. Special Foreign Currency Science Information Program.
Available from NTIS as TT-68-50355, for $6.00 paper copy, $1.45 microfiche. TT-68-50355 1969. 371 p. Translation of Dinamika i Mopfologiya Morskikh Beregov, Trudy Instituta Okeandlogii, Akademii Nauk SSR, Vol 48, 1961.

Descriptors: *Sedimentation, Geomorphology, Geologic history, *Waves(Water), *Currents(Water), Reviews, *Beach erosion, Sand spits, *Sand bars, *Lagoons, *Bays, Translations.
Identifiers: Books, Eustacy, Marine transgressions.

The dynamics and morphology of sea coasts is the subject of this collection of sixteen papers. Titles included are: Some Results of Regional Coastal Investigations in the USSR; History of the Formation of the Coasts of Kara-Bogaz-Gol; Developmental History and Present-Day Dynamics of the Chushka Spit; Some Data on the Post-Glacial Evolution of Karkinit Bay and the Accumulation of Bottom Sediments within It; Recent Development of the Temryuk Coast on the Azov Sea; Some Data on the Post-Glacial Transgression of the Bering Sea; Certain Structural and Development Coastal Features in the South of the Maritime Territory; Morphology and Evolution of a Lagoon Coast on Sakhalin; The Formation and Classification of Marine-Built Terraces on Emergent Coasts; Submarine Sand Ridges as Indicators of Longshore Migration of Sediments; Certain Aspects of the Interaction between Wave Flow and a Deformable Bottom at Low Velocities; The Possiblity of Forecasting Transient Coastal Relief Changes by Waves; The Determination of Maximum Wave Velocities in the Shore Zone of the Sea; The Effect of Wave Refraction on the Formation of an Equilibrium Profile of Submarine Coastal Slope; The Possibility of Predicting Longshore Currents in Tideless Seas; and The Role of Eolian Processes in the Dynamics of a Shallow Accumulation Coast. (See W74-04426 thru W74-04440) (Sinha - OEIS)
W74-04425

SOME RESULTS OF REGIONAL COASTAL INVESTIGATIONS IN THE USSR,
A. S. Ionin, P. A. Kaplin, and V. S. Medvedev.
In: Dynamics and Morphology of Sea Coasts, TT 68-50355, p 1-34, 1969. 6 fig, 2 tab, 86 ref. Trans. from Trudy Instituta Okeanologii, Akademii Nauk SSSR, Vol 48, 1961.

Descriptors: Coasts, *Sea level, *Estuaries, *Fjords, *Bays, *Deltas, *Waves(Water), Currents(Water), Morphology, Geomorphology, Translations.
Identifiers: *USSR, Tectonics.

The coastal dynamics and morphology of Soviet seas studied on a large scale for a period of ten years. Findings are summarized on distinctive structural and developmental characteristics of the coasts of a given sea and attention is drawn to several common features appearing ubiquitously on the coasts of all the Soviet seas. Three groups of coastal types are identified: coasts formed by subaerial and tectonic processes and little altered by the sea; coasts shaped mainly by non-wave factors; and coasts formed mainly by wave processes. It is suggested that on the whole, the post-Glacial eustatic rise in the level of the World Ocean being super-imposed on the tectonic movements of the structures of the earth's crust, exerted a tremendous influence on the formation of seaboard relief, leaving vivid traces on even tectonically mobile coasts. (See also W74-04425) (Sinha - OEIS)
W74-04426

HISTORY OF THE FORMATION OF THE COASTS OF KARA-BOGAZ-GOL,
O. K. Leont'ev.
In: Dynamics and Morphology of Sea Coasts, TT 68-50355. p 35-68, 1969. 8 fig, 27 ref. Trans. from Trudy Instituta Okeanologii, Academii Nauk SSSR, Vol 48, 1961.

Descriptors: *Geologic history, *Gulfs, *Bays, *Deltas, Quaternary period. Gemorphology, *Sea level, Translations.
Identifiers: *USSR(Caspian Sea), Tectonics.

The Kara-Bogaz-Gol is the largest inlet of the Caspian Sea. Information is presentedon the history of the formation of the coasts of this large gulf. The gemorphology and geological structures vary in different parts of the basin. An analysis of the development of the Kara-Bogaz-Gol coast and especially its bay-bar, reveals the importance of the balance of bottom sediments in the evolution of coastal accumulation forms. It is concluded that tectonic movements played practically no role in the evolution of the coastline in the Quaternary. The rapid fall of the Caspian Sea, and hence also of Kara-Bogaz-Gol after 1929 led to drastic alterations in the coastal relief and its dynamics. At present, the outer contour of the Kara-Bogaz-Gol depression and the water edge are separated by a wide expanse of salt plain, the surface of which formed by the top salt layer emerging from under the water. The coastal forms previously produced by wave processes now are beyond the reach of waves. A strait delta is the only feature being formed at present. (See also W74-04425) (Sinha - OEIS)
W74-04427

DEVELOPMENTAL HISTORY AND PRESENT-DAY DYNAMICS OF THE CHUSHKA SPIT,
V. L. Boldyrev.
In: Dynamics and Morphology of Sea Coasts, TT 68-50355. p 69-91, 1969. 5 fig, 33 ref. Trans. from Trudy Instituta Okeanologii, Akademii Nauk SSSR, Vol 48, 1961.

Descriptors: *Sediment transport, *Sand spits, Geologic history, *Bottom sediments, Bays, Coasts, *Winds, Translations.
Identifiers: Kerch Strait, *USSR(Chushka Spit), *Nearshore, Azov Sea.

The Chushka Spit situated in the north of the Kerch Strait is the only active coastal accumulation form in this area. It is 17.5 km long, and its width at the site of attachment to the bedrock coast is only 40-60 m. The spit has been developing for at least 2,500 years. During its main formation period the spit received its material from the adjacent stretch of bedrock coast undergoing vigorous abrasion, as well as from the bottom of the strait and from the south of the Azov Sea. In the comparatively Recent past, a drastic change again occurred in the trend of the coastal processes on Chushka, due to the change in its supply. The gradual straightening of the arc of Temryuk Bay by abrasion and accumulation and by the bay then filling with sediments deposited by the Kuban River, again made possible the considerable influx of sandy sediments from the bay to Chushka spit. This was facilitated by the dominant northeasterly winds, which have the largest force and duration and the highest incidence frequency. Certain signs, including the distribution of bottom sediments in the spit area, indicate progressive influx of sand to the spit also at the present time. (See also W74-04425) (Sinha - OEIS)
W74-04428

SOME DATA ON THE POST-GLACIAL EVOLUTION OF KARKINIT BAY AND THE ACCUMULATION OF BOTTOM SEDIMENTS WITHIN IT,
E. N. Nevesskii.
In: Dynamics and Morphology of Sea Coasts, TT 68-50355. p 92-110, 1969. 5 fig, 10 ref. Trans. from Trudy Instituta Okeanologii, Vol 48, 1961.

Descriptors: *Deposition(Sediments), *Sedimentation, *Erosion, Bays, Coasts, *Bottom sediments, *Shores, Translations.
Identifiers: Black Sea, *USSR(Karkinit Bay), Lobate coasts.

Karkinit Bay is the largest in the Black Sea. The bay outlines are very unusual. The abundance of sandy material gave rise to large accumulation coastal forms, causing heavy articulation of the coastline. These conditions resulted in a typical

lobate coast, which does not occur anywhere else on the Black Sea. A characteristic feature of the bottom relief in the bay is the extensive occurrence of transverse ridges mostly composed of sandy-shelly material, sometimes blanketed by sandy-silty sediments. The easternmost ridge is known as Churyumskaya bank. West of the bank lies the most distinct rise, which is the Bakalskaya bank. These are followed by two less distinct ridges, stretching from the shores of Tarkhankut Peninsula in the northwest to the opposite coast of the bay. Coastal accumulation forms, owing their sediment supply to coastal abrasion, pass through multiphase development during nonuniform transgression of the sea. They may 'die' and become restored, with a certain spatial shift depending upon the transgression rate and correspondingly upon abrasion rate for stretches of bedrock coast. Significant alterations in the coastal contour due to prolonged development of large coastal stretches may bring about final 'death' of coastal accumulation forms of a certain type, thus completing their multiphase developmental cycle. Simultaneously, the same change of coastal contour may produce conditions for the formation of other accumulation bodies, not uncommonly of other types on other coastal areas. On continuation of the nonuniform transgression, they likewise undergo multiphase development and may then disappear, having completed their cycle. (See also W74-04425) (Sinha - OEIS)
W74-04429

RECENT DEVELOPMENT OF THE TEMRYUK COAST ON THE AZOV SEA,
Yu. A. Pavlidis.
In: Dynamics and Morphology of Sea Coasts, TT 68-50335. p 111-123, 1969. 4 fig, 8 ref. Trans. from Trudy Instituta Okeanologii, Akademii Nauk SSR, Vol 48, 1961.

Descriptors: Coasts, *Sand spits, *Bottom sediments, *Bays, Sands, *Sedimentation, *Erosion, Geologic history, Translations.
Identifiers: *USSR(Azov Sea), Temryuk Coast, Nearshore processes, Kuban River.

Investigations covered the nearshore zone in the south of Temryuk Bay from Cape Akhilleon in the west to Verbyanaya spit in the east. In plan, this area is a shallow concave arc complicated by the wave-cut Akhilleon-Pekly prominence on the one side and by the protruding delta of the Kuban River on the other side. The present-day quantity of sand along the Temryuk coast is considerably larger than it was in the Recent past. The 1954 survey of bottom sediments performed by staff members of the Black Sea Experimental Research Station of the Institute of Oceanology of the Academy of Sciences of the USSR and the data obtained with a vibrating piston corer in 1958 show that at the present time sand forms a continuous belt on the nearshore bottom. The sand descends downslope to depths of 7 m, having an average thickness of some 1.5m in the Kuchugury-Golubitskaya area. The sand belt becomes somewhat wider opposite Peresyp, possibly due to the transport of sandy material through the Peresyp Strait. The thickness of sandy sediments is considerably larger on the east of the Kuban delta than on the west. (See also W74-04425) (Sinha - OEIS)
W74-04430

SOME DATA ON THE POST-GLACIAL TRANSGRESSION OF THE BERING SEA,
F. A. Shcherbakov.
In: Dynamics and Morphology of Sea Coasts, TT 68-50355. p 124-131, 1969. 4 fig, 11 ref. Trans. from Trudy Instituta Okeanologii Akademiya Nauk SSSR. Vol 48, 1961.

Descriptors: *Geologic history, *Sea level, *Sedimentation, *Erosion, *Deposition(Sediments), Costs, Translations.
Identifiers: Eustacy, Post glacial transgression, *Bering Sea, Black Sea.

Findings are compared with data on Recent past - Glacial transgression of the Black Sea. A comparison of data for the Black and the Bering Seas suggests that in both cases certain structural features of the submarine coastal slope occur at depths of 10 m. These features are apparently related to common causes, namely to the intermittent eustatic fluctuations of sea level during the post-Glacial transgression of the World Ocean. The question arises as to whether a relationship exists between the rate of sea level and that of the coastal processes. When the submarine relics of coastal accumulation forms in the Bering Sea were discussed., it was pointed out that their formation was related to a certain slowing down of transgression or even to a stabilization of sea level. However, it was most probably not a complete stabilization, but just a decrease in the rate of rise in sea level, when the latter reached a certain measure of equilibrium with the rate of coastal processes. The relationship between the rate and duration of changes in sea level on the one hand and the intensity of the effect of the coast-forming processes on the seaboard, on the other hand, is very important for reconstructing the history of coastal development. (See also W74-04425) (Sinha - OEIS)
W74-04431

CERTAIN STRUCTURAL AND DEVELOPMENTAL COASTAL FEATURES IN THE SOUTH OF THE MARITIME TERRITORY,
V. S. Medvedev, Y. S. Dolotov, and F. A. Shcherbakov.
In: Dynamics and Morphology of Sea Coasts, TT-68-50355. p 132-156, 1969. 11 fig, 38 ref. Trans. from Trudy Instituta Okeanologii Akademiya Nauk SSSR. Vol 48, 1961.

Descriptors: Geologic history, Coasts, *Bays, *Inlets(Waterways), Geomorphology, *Sedimentation, *Alluvium, Translations.
Identifiers: Geologic structures, Coastal uplift, USSR, Maritime Territory.

The coastline of the southern Maritime Territory west of Cape Povorotnyi and farther south to the boundary with North Korea is some 500 km long. The most characteristic feature of this seaboard is the complex indentation of its coastline. The coast is indented by numerous bays and inlets over its entire length, the Amur and Ussuri bays penetrating 50-70 km into the land. Other large bays are America, Voltok, Strelok, Slavyanskii, Poseta, etc. Such a complex coastal indentation is closely related to the geological structure of the region and depends primarily upon the strike and the combination of the major geological structures. The coasts of the southern Maritime Territory are comparatively young geomorphologically. Analysis of the coastal relief shows that the dominant role in the supply of accumulation forms and the straightening of the complex articulated contour has been played by alluvium throughout all the stages of its evolution as an embayed coast. The influx of sediments from the bottom became possible only after the submarine slope gradients were reduced again by alluvium. The importance of alluvium increased still further in the course of the Recent coastal uplift. The few forms which were largely dependent on abrasion debris for their supply have developed under the conditions of sediment deficit, undergoing reconstruction and washout. Alluvium is apparently the dominant factor in coastal zone dynamics not only of the southern Maritime Territory, but generally of embayed ingression coasts composed of rocks of fairly high resistance to abrasion and in the early stages of their geomorphological development. (See also W74-04425) (Sinha - OEIS)
W74-04432

MORPHOLOGY AND EVOLUTION OF ALAGOON COAST ON SAKHALIN,
A. T. Vladimirov.
In: Dynamics and Morphology of Sea Coasts, TT 68-50355. p 157-185, 1969. 8 fig, 1 tab, 13 ref. Trans. from Trudy Instituta Okeanologii, Akademii Nauk SSSR Vol 148, 1961.

Descriptors: Coasts, *Lagoons, Algae, *Sedimentation, *Littoral drift, Beaches, Geomorphology, *Sea level, *Shores.
Identifiers: *Bay-bars, Post glacial transgression, *USSR(Sakhalin Island).

The most characteristic structural feature of the northeastern seaboard of Sakhalin Island is the extensive development of lagoons. These lagoons stretch in a nearly continuous chain over more than 300 km. On the whole, the lagoons are shallow and in a majority of cases have a thick covering layer of algae. Morphological analysis data have established the existence of three beach drifts within the boundaries of the northeastern coastal region of Sakhalin. Data determined by investigations of the seaboards of several seas show that the straightening of the coastal contour is often the leading process in the last stages of coastal development. Depending upon the initial contour and the structure of the submarine coastal slope, accumulation forms of different genesis could arise in the first stages of development. However, further straightening of the coast and gradual merging of accumulation forms caused the majority to become polygenetic. Extensive straightening of the coastline, and development of a lagoon coast which replaced the earlier, mostly ingressive coasts were the result of a general slowing down of post-Glacial transgression followed by relative stabilization of sea level. The region of Sakhalin Island was cited by Zenkovich (1946) as a typical example of the development of an embayed coast with a gentle submarine slope. The detailed analysis of the data demonstrated the very complex nature of the coastal development under actual specific conditions, and likewise confirmed the proposed schemes. (See also W74-04425) (Sinha - OEIS)
W74-04433

SUBMARINE SAND RIDGES AS INDICATORS OF LONGSHORE MIGRATION OF SEDIMENTS,
V. L. Boldyrev.
In: Dynamics and Morphology of Sea Coasts, TT 68-50355. p 207-217, 1969. 2 fig, 25 ref. Trans. from Trudy Instituta Okeanologii, Akademii Nauk SSSR, Vol 48, 1961.

Descriptors: *Sand waves, *Littoral drift, *Sediment transport, *Waves(Water), Sand bars, Translations.
Identifiers: *Submarine sand ridges, Black Sea, Azov Sea, Baltic Sea.

Field observations on the coasts of the Black, the Azov, and the Baltic seas and analysis of air photographs for different coastal stretches demonstrated that the relative number and arrangement of submarine ridges, as well as the granulometric distribution of sediments in the ridge zone, are directly related to variations in the principal parameters of beach drifts and the total reserves of unconsolidated debris on the bottom. Variations in the morphology and dynamics of submarine ridges are usually closely related to variations in the principal parameters in the beach drift, viz., its transporting capacity and competence. A decrease in the number of ridges or their total disappearance in the path of the beach drift indicates a considerable variation of the hydrodynamic regime. The presence of even a single ridge in the path of the beach drift indicates transit of sediments in the area, providing steady supply for the ridge. The appearance of single or several ridges in the path of obviously undersaturated beach drift in certain coastal areas indicates a drop in competence and partial accumulation of sediments on the bottom. An increase in the number of submarine ridges in the path of the beach drift likewise indicates increased carrying power or

decreased competence. The presence of coarse-grained sediments and coarse debris in the troughs between the ridges, as well as bottom areas which have no sediments, indicates undersaturation of beach drift. The echelon arrangement of ridges indicates that they are being formed by waves and not by currents, although the latter introduce certain modifications in the ridge morphology, e.g., they may facilitate the overdeepening of troughs and hence a more pronounced ridge relief. (See also W74-04425) (Sinha - OEIS)
W74-04434

CERTAIN ASPECTS OF THE INTERACTION BETWEEN WAVE FLOW AND A DEFORMABLE BOTTOM AT LOW VELOCITIES,
B. A. Shuyak.
In: Dynamics and Morphology of Sea Coasts, TT68-50355. p 218-283, 1969. 12 fig, 6 tab, 30 ref. Trans. from Trudy Instituta Okeanologii, Akademii Nauk SSSR, Vol 48, 1961.

Descriptors: *Ripples, Aeolian soils, Wind, Coastal structures, *Waves(Water), Flow, *Sedimentary structures, Hydraulic structures.
Identifiers: Black Sea, Bottom topography.

Results are presented of studies of periodic structures of wave flow, including the conditions and mechanism of the formation of periodic wave structures; dependence of their parameters upon those of wave flow, liquid and particle constants; dependence of the symmetry of structures upon that of flows; and classification of wave, channel, and eolian periodic forms. Also discussed are transverse periodicity of ripples; the barrier effect; dependence of the velocity of ripples and particle flow upon wave parameters; kinematics of the bottom layer of a wave flow passing over a periodically deformed bottom; and, finally, the application of artificial periodic structures of the wave flow to the protection of hydraulic structures against burial by sediments. (See also W74-04425) (Sinha - OEIS)
W74-04435

THE POSSIBILITY OF FORECASTING TRANSIENT COASTAL RELIEF CHANGES BY WAVES,
V. V. Longinov.
In: Dynamics and Morphology of Sea Coasts, TT68-50355. p 284-306, 1969. 1 fig, 13 ref. Trans from Trudy Instituta Okeanologii, AkademiiNauk SSSR, Vol 48, 1961.

Descriptors: *Waves(Water), Coasts, *Profiles, *Slopes, *Tides, *Sediment transport, Translations.
Identifiers: *Wind waves.

Section I deals with the factors controlling the changes of the coastal zone relief and the mechanism of such changes. Section II provides a classification of the profile types found in the coastal zone, based on their hydrodynamic features and their relation to the dynamics of relief and sediments established in Section I. Section III provides certain principles for forecasting coastal zone relief dynamics, or at least the alterations in its profile. The profile dynamics of the submarine coastal slope is considered mainly as a two-dimensional problem. Under natural conditions the movement of the water and sediments in the coastal zone occurs mainly simultaneously along the profile and along the shoreline. Eventually, it will only be possible to understand the changes occurring in this zone and to forecast them correctly by dealing with the relief dynamics in the coastal zone as a three-dimensional problem. A classification of profiles consists of the following: profiles with pebble beaches, 'rugged' for a great majority of waves; sandy profiles with large gradients; sandy profiles with small gradients; the extremely shallow sandy profiles; and finally, the coastal zone relief that faithfully follows the bedrock relief, although the latter may be covered by a sediment blanket. Relief dynamics in the coastal zone are thus organized for further detailed study. (See also W74-04425) (Sinha - OEIS)
W74-04436

THE DETERMINATION OF MAXIMUM WAVE VELOCITIES IN THE SHORE ZONE OF THE SEA,
V. V. Longinov.
In: Dynamics and Morphology of Sea Coasts, TT68-50355. p 307-329, 1969. 3 fig, 6 tab, 13 ref. Trans from Trudy Instituta Okeanologii, Akademii Nauk SSSR, Vol 48, 1961.

Descriptors: Coasts, *Shores, *Waves(Water), *Slopes, Profiles, Measurement, *Pressure, *Shallow water, Translations.
Identifiers: Nearshore processes, *Wave velocity, Wave pressure.

The solution of many practical problems requires the determination of the maximum wave velocities in a certain horizon of the water column in the shore zone seawards of the wave dissipation zone for given parameters of the deepwater waves and a certain submarine coastal slope relief. The method proposed for determining wave velocities in the shore zone is based on data elicited by field measurements of wave velocity pressures with VDK devices, most of which have already been published (Longinov, 1958). A few empirical equations and coefficients are provided for determining more accurately undulatory movements of water in the shore zone based on additional observations and certain new phenomena discovered by recent measurements. An attempt was made to transfer readings of the VDK device to real velocities, but the reliability of this transition was far from established. The first section of this paper deals with the substantiation and more accurate description of this transition. Section II provides a method for calculating the asymmetry of pressures, based on observations. Section III provides the correction factors for transition from the mean values of observed pressures to values with a reliability of 5 and 1%. In Sections IV and V the results of measurements of the frontal and the vertical wave pressure components are given. Section VI offers certain experimental data on normal pressure variations according to the horizon in which the measurement device was installed. (See also W74-04425) (Sinha - OEIS)
W74-04437

THE EFFECT OF WAVE REFRACTION ON THE FORMATION OF AN EQUILIBRIUM PROFILE OF SUBMARINE COASTAL SLOPE,
B. A. Popov.
In: Dynamics and Morphology of Sea Coasts, TT68-50355. p 330-349, 1969. 5 fig, 11 ref. Trans from Trudy Instituta Okeanologii, Akadomii Nauk SSSR, Vol 48, 1961.

Descriptors: *Shores, *Refraction(Water waves), *Waves(Water), Coasts, Profiles, *Slopes, Translations.
Identifiers: Wave action, *Equilibrium profile.

Refraction of waves is among the main factors controlling the formation of an equilibrium profile of the submarine slope. It enhances the natural trend of the process. A profile of any shape cannot reverse its curvature without the interference of additional factors. Under the influence of refraction, a convex slope must inevitably develop as abrasional, while a concave slope must develop as a accumulative. A planar smooth submarine slope may develop different equilibrium profiles, depending upon its gradient, being in the main an accumulation profile in the case of small initial gradients and an abrasion profile in the case of fairly large gradients. An abrasion equilibrium profile may be formed in principle in certain cases where there is a small initial bottom gradient, although at first glance this conclusion contradicts the established ideas. Investigations of wave interaction with slopes undergoing washout in wave tanks exclude the effect of refraction. In this manner the process is distorted and much care is needed to interpret the results. It is preferable that such investigations be performed on spatial shore models in wave basins. (See also W74-04425) (Sinha - OEIS)
W74-04438

THE POSSIBILITY OF PREDICTING LONGSHORE CURRENTS IN TIDELESS SEAS,
I. F. Shadrin.
In: Dynamics and Morphology of Sea Coasts, TT68-50355. p 350-364, 1969. 2 fig, 1 tab, 14 ref. Trans from Trudy Instituta Okeanologii, Akademii Nauk SSSR, Vol 48, 1961.

Descriptors: Coasts, *Shores, *Waves(Water), *Circulation, *Shallow water, Translations.
Identifiers: Nearshore, *Wave energy, *Longshore currents, Shoaling, Breaking waves, Wave theory.

The principal process in water dynamics in the shore zone is the transformation of wave energy which on the whole determines also the character of water circulation in the vicinity of the shore. Calculations of the velocities of longshore currents are therefore based on the transformation of wave energy in the transformation of the shoaling waves from purely oscillatory into translatory motion of the entire agitated water column. Complexity of the process prevented the elaboration of a strict theory which would describe the actual shoaling waves from the beginning of deformation to the moment of breaking with the necessary degree of accuracy Therefore, when considering the factors generating currents in the shore zone, that wave theory is chosen which offers the best agreement with the actual waves observed in the shallow area under investigation. (See also W74-04425) (Sinha - OEIS)
W74-04439

THE ROLE OF EOLIAN PROCESSES IN THE DYNAMICS OF A SHALLOW ACCUMULATION COAST,
N. A. Aibulatov.
In: Dynamics and Morphology of Sea Coasts, TT68-50355. Vol 48 p 365-371, 1969. 3 fig, 8 ref. Trans from Trudy Instituta Okeanologii, Akademii Nauk SSSR, Vol 68, 1961.

Descriptors: Aeolian soils, *Sediment transport, *Dunes, *Wind erosion, *Beaches, Profiles, Coasts, Translations.
Identifiers: *Aeolin sands, Black Sea, *Wind transport.

In investigations of the dynamics of sandy marine deposits it was necessary to study eolian processes, since it was impossible not to take their effects into account in the coastal zone. For instance, the following vivid instance of the burying effect of eolian deposits in one of the ports was observed. Strong continental winds (up to 20 m/sec) formed a sandy beach some 5 m wide at the almost sheer port wall in five days. Investigations were carried out in an area of the Anapa bay-bar in the Black Sea. Even under the specific conditions of Anapa bay-bar, the volumes of wind-transported sand demonstrated the importance of the wind-sand stream in the dynamics of as to the degree of capitalization and the extent to which it can be measured. (Hoffman-North Carolina)
W74-04440

A LABORATORY INVESTIGATION OF FREE SURFACE FLOWS OVER WAVY BEDS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8B.
W74-04477

MUDFLOWS (SELEVYYE POTOKI),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 4D.
W74-04581

SLOPE DEVELOPMENT ON A MISSISSIPPI RIVER BLUFF IN HISTORIC TIME,
King's Coll., London (England). Dept. of Geography.
D. Brunsden, and R. H. Kesel.
Journal of Geology, Vol 81, No 5, p 576-598, September 1973. 15 fig, 3 tab, 27 ref.

Descriptors: *Degradation(Slope), *Slopes, *Geomorphology, *Bank erosion, Topography, Terrain analysis, Erosion, *Mississippi River, Alluvium, Alluvial channels, *Louisiana.

Hillslope development was examined along a segment of the Mississippi River bluff at Port Hudson, Louisiana. The entire bluff segment was being undercut by a meander of the Mississippi River in 1722. Since that time, the meander has migrated downstream progressively, abandoning the river bluff. A space-time calibration of the hillslopes along the bluff was made by determining the position of the river along the bluff base from historic maps and aerial photographs. In plan, the bluff was divided into three segments: high, intermediate, and low intensity according to processes acting along the base of the bluff. The high-intensity zone represents a zone of active undercutting by the river, the intermediate zone is characterized by basal scour, and the low-intensity zone by basal aggradation. The present rate of retreat for each segment was calculated to be 75, 1.0, and 0.63 ft/year, respectively. The slope profiles within the three zones represent a sequential change reflecting the change in basal conditions. Hillslopes grade from the high-intensity zone, where profiles have a mean slope angle of 44 deg and a well developed cliff face, to the concave profiles of the low-intensity zone. The latter profiles lack the cliff face and have a mean slope angle of 19.5 deg. Slope profiles in each of the zones reach a steady-state condition. It is estimated that a steady-state condition for slopes subjected to subaerial processes can be achieved in slightly more than 90 years. (Knapp-USGS)
W74-04585

THE EFFECT OF COLLECTING TIME AND GRAIN SIZE ON THE SAMPLING OF STREAM SEDIMENTS FOR GEOCHEMICAL MAPPING IN THE ST. CATHARINES AREA, ONTARIO,
Brock Univ., St. Catharines (Ontario). Dept. of Geological Sciences.
E. Gawron.
Available from Brock University, Dept. of Geological Sciences, St. Catharines, Ontario, Canada. Price $2.00. Research Report Series, No 6, Studies in Landscape Geochemistry, No 3, February 1973. 45 p, 9 fig, 2 tab, 9 ref. Canada Geol. Survey Grant 11-70 NRC Grant A 7715.

Descriptors: *Sampling, *Particle size, *Waste quality, *Sediments, *Water pollution, *Canada, Geochemistry, Mapping.
Identifiers: St. Catharines(Ontario).

Factors that influence the variation of chemical data were studied in the Twelve Mile Creek drainage basin of St. Catharines, Ontario. Time of sampling in an industrial and urbanized area is of more importance than in the rural areas. Samples should be collected at specific intervals of time to obtain representative data. During the course of this study, man's influence on the rural scene is at a minimum in the fall and the time of collection did not matter as much as it did in the industrial and urbanized area. To obtain comparable data in a time study or a site study, the sample material should be as similar as possible. For example, a clay sediment contains a higher concentration of trace elements than a sand sediment from the same site. In a time study, the variation of data due to the change in sediment material could be greater than the variation due to time depending on the location. Site inhomogeneity does not affect the variance of chemical data. (Knapp-USGS)
W74-04587

A NUMERICAL CLASSIFICATION OF SELECTED LANDSLIDES OF THE DEBRIS SLIDE-AVALANCHE-FLOW TYPE,
Macquarie Univ., North Ryde (Australia). School of Earth Sciences.
R. J. Blong.
Engineering Geology, Vol 7, No 2, p 99-114, October 1973. 2 fig, 7 tab, 26 ref.

Descriptors: *Landslides, *Classification, *Computer programs, Geomorphology, Mass wasting, *Debris avalanches, Mudflows.

A sample of 92 landslides from the greywacke hill country of the North Island of New Zealand was classified using a computer program, on the basis of 19 numerical and 43 disordered multistate attributes. The results of the agglomerative polythetic classifications do not help to distinguish these landslide phenomena clearly. Furthermore, the formation of individual groups within the computer classifications is dependent upon a wide variety of landslide characteristics. The groups, once formed, frequently bear no resemblance to landslide categories defined in more traditional classifications. Although landslide location on the hillslope proved a useful criterion in the second computer classification, because some other local landslide characteristics are partly controlled by distance from the base of the hill, this attribute is hardly likely to provide the basis of a universally applicable classification. As no one of these classifications of landslides provides any rational basis for comparison of slope failures from area to area, until a realistic scheme is forthcoming it seems sensible to rely on a simple division of landslides according to the nature of the dominant movement. However, the three basic types of failure--rotation, translation, and flowage--must be supplemented by a transitional fourth type, that dominated both by flow and by translational failure. (Knapp-USGS)
W74-04591

PALEOHYDROLOGY AND SEDIMENTOLOGY OF LAKE MISSOULA FLOODING IN EASTERN WASHINGTON,
Texas Univ., Austin. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2E.
W74-04599

STUDY OF BEACH WIDENING BY THE PERCHED BEACH CONCEPT, SANTA MONICA BAY, CALIFORNIA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W74-04603

A STUDY ON MASS TRANSPORT IN BOUNDARY LAYERS IN STANDING WAVES,
Kyota Univ. (Japan). Disasters Prevention Research Inst.
H. Noda.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 15, p 227-247, 1969. 9 fig, 9 ref.

Descriptors: *Waves(Water), *Shallow water, Flow, Boundary layers, *Sediment transport, Harbors, Coasts, Convection.
Identifiers: *Standing waves, *Mass transport, Japan, Shoaling.

Mass transport in the boundary layers developed on smooth and horizontal bottoms by standing waves in shallow water is discussed. In a theoretical approach, the basic equations of laminar boundary layers are applied to solving the oscillatory motion in the boundary layers caused by the standing waves. The mass transport velocities are derived on the basis of solutions of the second approximation which describe the flow velocity near the bottom, and the effects of convective terms involved in the basic equations are investigated. Experimental measurements in standing waves of mass transport velocity in the bottom boundary layer were carried out using dye-streak and solid-particle methods. The experimental data are compared with the theoretical prediction. (Sinha - OEIS)
W74-04615

APPLICATION OF FLUORESCENT COATED SAND IN LITTORAL DRIFT AND INLET STUDIES,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
For primary bibliographic entry see Field 2L.
W74-04616

QUANTITATIVE TRACING OF LITTORAL DRIFT,
Norges Tekniske Hoegskole, Trondlheim. Dept. of Harbour Engineering.
P. Bruun.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 2, Chap 20, p 322-328, 1969. 5 fig.

Descriptors: *Littoral drift, *Bed load, *Sediment transport, Tracers, Fluroescent dyes, *Florida.
Identifiers: *Tidal currents, *Longshore transport, Bottom creep.

Tests were run at Fernadina Beach, Florida, using fluorescent tracers and bed load traps with automatic doors and hydraulic lift to determine the thickness of the bed load transport layer on the bottom ('bottom creep'). Longshore transport as bed load seems to increase with longshore wave energy. The importance of a longshore (tidal) current superimposed on the wave-energy current was noted for the low-energy section. The importance of the longshore current is also evident from the trough transports predominance over bar transport for the energy levels under consideration. This is undoubtedly going to change for higher inputs of wave energy accompanied by frequent wave breaking and stir-up activity on the bar. The results are of preliminary and indicative nature only. (Sinha - OEIS)
W74-04617

VARIABLE DISPERSION AND ITS EFFECTS ON THE MOVEMENTS OF TRACERS ON BEACHES,
Hydraulics Research Station, Wallingford (England).
W. A. Price.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 2, Chap 21, p 329-334, 1969. 4 fig, 1 ref.

Descriptors: *Tracers, *Sediment transport, *Beaches, Model studies, *Tidal effects, Dispersion, *Shallow water, Coasts, Littoral drift.
Identifiers: Arithmetical models, Centroid method.

To arrive at a quantitative assessment of sediment transport using tracers it is usual to analyse the results using 'centroid method'. It is satisfactory to apply such a method when the dispersion from any cause is constant over the area under study. However, when tracers are used in a variable dispersive field, as on a beach, the interpretation

of the results by normal methods can give misleading results. A simple arithmetical model is used to demonstrate that it could be misleading to interpret the movements of tracers injected into a variable dispersive field, on and near a beach, by the normal methods. If, however, the present arithmetical model could be made to work quantitatively (that is values could be ascribed to the dispersion coefficients at all points on the bed) then tracer distributions measured in nature could be corrected for the apparent mass transport effect in the onshore/offshore direction so that lateral distributions of tracer could then be used to establish the quantity of drift at various levels. (Sinha - OEIS)
W74-04618

A FIELD INVESTIGATION OF SAND TRANSPORT IN THE SURF ZONE,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
E. B. Thornton.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 1, Part 2, Chap 22, p 335-351, 1969. 8 fig, 5 ref.

Descriptors: *Florida, *Beaches, *Sediment transport, Bed load, *Waves(Water).
Identifiers: Fernandina Beach(FL), *Surf zone, *Water depth, Energy spectra, Kinetic energy, Potential energy.

The distribution of bed-load sand transport normal to the beach has been measured in a series of field experiments conducted in the surf zone at Fernandina Beach, Florida. Simultaneous measurements were made of the waves and water particle motion at various locations in the surf zone. The energy flux of the waves was resolved into its longshore component from the measured directional and energy spectra. The bed-load transport is related to the depth of water and longshore energy flux. Insight into the mechanics of sediment transport is obtained by comparing the wave and water particle motion energy spectra, which give a direct measure of the kinetic and potential energy, at various locations in the surf zone. (Sinha - OEIS)
W74-04619

THE EFFECT OF WAVES ON THE PROFILE OF A NATURAL BEACH,
Naval Postgraduate School, Monterey, Calif.
W. C. Thompson, and J. C. Harlett.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 2, Chap 23, p 352-372, 1969. 8 fig, 8 ref.

Descriptors: *Beaches, *Waves(Water), *Profiles, *Sedimentation.
Identifiers: *Wave steepness, Equilibrium profiles, *Hindcasts.

A 60-day study was conducted on a selected natural beach in which the beach profile was measured daily and the waves incident upon the profile were recorded continuously. Beach and wave parameters derived from the field data were empirically combined to yield: (a) quantitative relationships between the change in the profile and the average deep-water wave steepness and wave power over a lunar day (24.8) hours given the profile at the beginning of the period, (b) equilibrium profiles for different values of wave steepness, (c) an empirical relationship between wave steepness and wave power which agrees well with theory, and (d) rates at which the beach profile approached equilibrium for given initial conditions of non-equilibrium. Using the relationship developed between beach change and wave steepness, hindcasts were made of the day-to-day sand elevation at a selected location near the middle of the profile and were found to agree fairly well with the observed sand level. (Sinha - OEIS)
W74-04620

COLLECTIVE MOVEMENT OF SEDIMENT IN LITTORAL ENVIRONMENT,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
C. J. Sonu.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 1, Part 2, Chap 24, p 373-400, 1969. 16 fig, 35 ref. Nonr 1575(03), NR 388-002.

Descriptors: *Sediment transport, *Littoral, *Sand waves, Beaches, *Beach erosion, Profiles, *Sand bars.
Identifiers: Nearshore processes, Longshore currents.

Collective movements of sediment occur in the form of sand waves in the nearshore zone and affect beach topography to a significant extent. Bar-type sand waves move only in the onshore direction and account for various accretive profiles on the subaerial beach. When the beach is eroded, these sand waves are simply disintegrated on the subaerial beach, instead of migrating back in the form of sand waves. These characteristics of bar-type sand waves help explain dynamic behavior of beach profiles with respect to profile configuration, sediment storage, and beach width. Cusp-type sand waves are considered to be a product of interaction between longshore currents and an erodible bed. Their presence causes variability in beach profiles along the shore between those containing a prominent bar and those without a bar. Migration of these sand waves may well produce pulsational transfer of material along the shore. (Sinha-OEIS)
W74-04621

WAVE PERIOD AND THE SWASH ZONE ENERGY BALANCE,
Puerto Rico Univ., Mayaguez. Dept. of Marine Sciences.
G. S. Giese.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 1, Part 2, Chap 25, p 401-414, 1969. 2 fig, 5 tab, 11 ref.

Descriptors: *Beaches, Infiltration, *Waves(Water), *Sediment transport.
Identifiers: Pebbles, Sorting, *Swash zone, *Breaking waves, *Wave period.

The shape sorting of pebbles in the swash zone was studied in an effort to determine the effect of the amount of foreshore infiltration per wave on the swash zone energy balance. Measurements were made of pebbles collected from the swash limit and from the step of selected sandy beaches. The pebbles were sampled on occasions when, and at locations where, the conditions of breaker height, breaker approach angle and foreshore slope fell within predetermined limits. The wave period and the foreshore infiltration rate varied among the beaches and were measured. The results of these measurements indicate that the mean shape of swash limit pebbles, and presumably, therefore, the swash zone energy balance depends upon the amount of foreshore infiltration per wave. Therefore the dynamics of the swash zone the effect of wave period and the effect of foreshore permeability must be considered together. (Sinha-OEIS)
W74-04622

LITTORAL DRIFT AS FUNCTION OF WAVES AND CURRENT,
Waterloopkundig Laboratorium, Delft (Netherlands).
E. W. Bijker.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 1, Part 2, Chap 26, p 415-435, 1969. 2 fig, 12 tab, 7 ref.

Descriptors: *Littoral drift, *Waves(Water), *Currents(Water), Coasts, *Sediment transport, Bed load.
Identifiers: Longshore transport, *Tidal currents, *Longshore currents, Ivory Coast, Abidjan, Bed shear.

An attempt is made to compute the littoral drift, starting from the longshore current velocity as it is generated by the waves or as it may originate from other causes. For the actual computation of the bed load transport a normal bed load transport formula is used, in which, however, according to the method developed in earlier studies, the bed shear is increased as a result of the wave motion. From the tests described it becomes clear that the transport may be treated indeed as a function of the longshore current, even when this current has a direction opposite to that of the component of the wave propagation parallel to the coast. Finally, a computation procedure for littoral drift is presented in which also the transport of suspended load is taken into account, and an example is given of the computation of the littoral drift along Ivory Coast near Abidjan. The result of this computation corresponds rather well to the data known from the prototype. (Sinha-OEIS)
W74-04623

SIMULATION OF HORIZONTAL TURBULENT DIFFUSION OF PARTICLES UNDER WAVES,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
S. P. Murray.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 1, Part 2, Chap 28, p 446-466, 1969. 11 fig, 4 tab, 19 ref. Nonr 1575(03), NR 388-002.

Descriptors: *Sediment transport, *Turbulence, *Diffusion, Fluid flow, *Fluid mechanics, Photography.
Identifiers: Shoaling, Nearshore processes, Power spectra.

By oscillation of an array of turbulence-generating grids in still water, the turbulent fluid velocity field in shoaling waves near the bottom is simulated in a laboratory channel. Solid particles with fall velocities varying between 1 and 40 mm/sec are introduced into the test volume from above. Multiple-image photography using ultraviolet lighting techniques and a suitably placed mirror allows recording of the grain trajectories as functions of time and three space dimensions simultaneously. The Lagrangian intensities of turbulence and diffusion coefficients are then directly measured from the photographic data. The scale times, scale lengths, and the frequencies of the power spectra modes can then be calculated. Properties of the fluid turbulence are inferred from the quasi-neutral particles. The analysis, which is restricted to the component of diffusion in the horizontal direction normal to the grid motion, shows that the turbulent velocity distributions of both fluid and heavy particles are Gaussian, and that their standard deviations (intensities of turbulence) increase regularly with increasing grid Reynolds numbers (grid speeds). Diffusion coefficients likewise generally increase with increasing grid Reynolds numbers. Diffusivities of the heavy particles relative to the fluid are a function of both particle fall velocity and the structure of the fluid turbulence itself. (Sinha-OEIS)
W74-04624

THE ATLANTIC COAST OF LONG ISLAND,
Army Engineer District, New York.
For primary bibliographic entry see Field 8A.
W74-04626

CONSTITUENT TRANSPORT IN ESTUARIES,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.

W74-04627

WATER DENUDATION OF MOLEHILLS IN MOUNTAINOUS AREAS,
E. Jonca.
Acta Theriol. Vol 17, No 21-31, p 407-412, 1972.
Identifiers: Meadows, Moles, *Molehills, Mountainous regions, Pastures, *Poland(Karkonosze mountains), Water denudation , *Zoogenic denudation, Erosion.

During its burrowing activities the mole forms numerous molehills on the surface of fields, pastures and meadows. In undulating tracts of land these molehills undergo degradation as the result of denudation and surface erosion processes. Zoogenic denudation processes are particularly active in mountainous areas owing to the climatic and topographic conditions stimulating them there, namely, rapid thawing of snow, considerable water flow, sharp slope gradient and existence of slippery areas of various kinds facilitating transport of rock material down slopes. In the Karkonosze mountain area, Poland zoogenic denudation caused by the mole activity varied from 1-3 tons of rock material/ha pasture annually.--Copyright 1973, Biological Abstracts, Inc.
W74-04639

EFFECT OF THE FOREST ON THE DISPLACEMENT OF THE DESNA RIVER BED AND THE SIGNIFICANCE OF THIS EFFECT ON FOREST PLANTING IN THE FLOODPLAIN, (IN RUSSIAN),
For primary bibliographic entry see Field 4A.
W74-04641

FLOATING BREAKWATER PONTOON,
Reid, Middleton and Associates, Inc., Edmonds, Wash.; and Poly Sintering, Inc., Seattle, Wash. (Assignees).
For primary bibliographic entry see Field 8B.
W74-04711

SHORE TRANSPORT. FORMATION OF SAND SPITS AND TOMBOLOS,
G. Sauvage de Saint Marc, and G. Vincent.
Available from NTIS as AD-672 501, for $6.00 paper copy, $1.45 microfiche. California University, Berkeley, Hydraulic Engineering Lab. Technical Report No HEL-2-17, May 1968. Translation of Transport Littoral Formation De Fleches Et De Tombolos (1954). 42 p, 26 fig, 7 ref. DACW72-67-C-0015.

Descriptors: *Sediment transport, Model studies, Ocean waves, Ocean currents, Littoral, *Coasts, *Sand spits, *Waves(Water), *Currents(Water), *Shallow water, Geomorphology, Translations.
Identifiers: *Littoral transport, Longshore currents, Breaking swell, Wave action.

This study of the formation of sand spits and tombolos is based upon experimenting on models. Because of the essential role of breaking waves, the discussion centers on the action of waves and currents which they generate on the transport of sand along the coast. When swells impinge obliquely on a beach, the breaking swells dig into the beach and set grains of sand into motion and then the sand can be carried away by a current. Consideration is given to the intensity of shore transport under the influence of currents due to the breaking of swells; the influence of swell amplitude, swell wave length, and steepness; the influence of the nature of the sediment; influence of the breaker angle on the intensity of littoral transport; and formation of sand spits. Although the difference between a spit and a tombolo is not always clear, they seem to be formed in different ways. The formation of tombolos appears to be related to the motion of the swell current of 'lateral expansion' which is due mainly to the progressive decrease in amplitude of the swell in the lee of an obstacle such as an island or artificial structure (breakwaters). (Sinha-OEIS)
W74-04722

SURF,
Wisconsin Univ., Madison. Mathematics Research Center.
R. E. Meyer.
Available from NTIS as AD-698 999 for $6.00 paper copy, $1.45 microfiche. Technical Summary Report No 978, July 1969. 52 p, 22 fig, 34 ref. DA-31-124-ARO-D-462.

Descriptors: *Beaches, *Waves(Water), *Surf, *Bed under water, *Beach erosion, Tsunamis, Resonance, Bores, Shallow water.
Identifiers: *Wave run-up, *Shore processes.

Some phases of research, over the last decade, on water waves strongly influenced by the seabed are reviewed. Progress made in the understanding of the transformation of waves into run-up and backwash on a beach is discussed. This phenomenon is closely related to the theory of singular partial differential equations. Results on the resonance of unbounded water bodies adjacent to shores are summarized. (Sinha-OEIS)
W74-04725

SEDIMENTATION IN HAWKE BAY,
Department of Scientific and Industrial Research, Wellington (New Zealand). Oceanographic Inst.
For primary bibliographic entry see Field 2L.
W74-04726

STUDIES OF A SOUTHERN FIORD.
Department of Scientific and Industrial Research, Wellington (New Zealand). Oceanographic Inst.
New Zealand Department of Scientific and Industrial Research Bulletin 157, New Zealand Oceanographic Institute Memoir No 17, 1964. 101 p.

Descriptors: Coasts, *Sedimentation, *Fjords, *Sounds, Hydrology, Ecology, Biology, Sediments, Sulfur compounds.
Identifiers: *New Zealand(Milford Sound).

A compilation is presented of eight studies on the fjordland shelf and Milford Sound, New Zealand. In addition to reports on the hydrology and sedimentation in Milford Sound, studies are reported on the biology and ecology of the Sound. Included also is a study on transformation of sulphur compounds in the sediments of the Sound. Results show that stagnation is not a phenomenon common to the bottom water of all fjords. (Sinha-OEIS)
W74-04727

SELECTED BIBLIOGRAPHY ON BEACH FEATURES AND RELATED NEARSHORE PROCESSES.
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
Available from NTIS as AD-464 497 for $6.00 paper copy, $1.45 microfiche. Coastal Studies Series No 11, November 1965. 59 p. Nonr 1575(03).

Descriptors: *Bibliographies, *Beaches, Geomorphology, Coasts, Oceanography, Hydrology, Meteorology, *Coastal engineering, Estuaries, *Waves(Water), *Currents(Water), *Tides, Winds.
Identifiers: Nearshore processes.

The bibliography contains approximately 75% of the most pertinent literature on the subject of beach features and related nearshore processes. The material is listed by subject and by name of author. The fact that about 80 percent of the references are post-1940 reflects a lack of beach process research prior to world war II. A number of the general papers could be listed under more than one subject heading, so an evaluation of their principal content determined their classification. Specific fields covered are: coastal morphology - beach ridges, dunes, inlets, storm induced changes, beach-face configuration, bottom configuration, measurement techniques, sediment properties, sediment transport, beach and nearshore process, shoaling, breaking waves, tides, littoral currents, wave refraction, storms and hurricanes, aeolian processes, coastal engineering and quantitative analysis. The final section contains references to special bibliographies and additional source materials. An author index is included. 1342 items are identified. (Sinha-OEIS)
W74-04728

INSHORE SEA SURFACE TEMPERATURE AND SALINITY CONDITIONS AT AGATE BEACH, YAQUINA BAY AND WHALE COVE, OREGON, IN 1970,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-04730

AN ANNOTATED BIBLIOGRAPHY OF FLUSHING AND DISPERSION IN TIDAL WATERS,
Navy Hydrographic Office, Washington, D. C.
For primary bibliographic entry see Field 2L.
W74-04731

RESEARCH IN THE COASTAL AND OCEANIC ENVIRONMENT. A SUMMARY OF RESEARCH ACCOMPLISHED UNDER PROJECT THEMIS,
Delaware Univ., Newark.
For primary bibliographic entry see Field 2L.
W74-04732

SEA WAVES AND BEACH CUSPS,
M. S. Longuet-Higgins, and D. W. Parkin.
Geographical Journal, Vol 128, No 2, p 194-201, June 1962. 3 fig, 1 tab, 11 ref.

Descriptors: *Waves(Water), *Beaches, Stratification, *Percolation, *Bays, *Erosion.
Identifiers: Beach cusps, Wave height, *Swash, Shingle, *United Kingdom(England).

Some observations and experiments are briefly described that were carried out in two places on the south coast of England, at Tide Mill near Seaford, and on Chesil Bank, to relate the formation of the cusps to the characteristics of the waves. A model-scale experiment performed by the Hydraulics Research Station, Wallingford, is also reported. It is concluded that the dimensions of the cusps are related more to the length of the swash than to the wave height or wave period, and for a given beach the mean lateral spacing between the cusps is an increasing function of the swash length. The cusps seem to form most easily when there is a vertical stratification of material, with relatively coarse shingle at the surface and a mixed, impermeable layer a few inches beneath. This can be quite simply explained in terms of the mobility of the material in the swash zone; an underlying impermeable layer reduces the percolation of the swash through the beach and so increases the power of the waves to move the shingle. Further the heaped shingle on the cusp promontories is more permeable than the thinner layer in the bays, and consequently is less subject to erosion. This contributes to the relative permanence of the cusp system. Waves whose height is too great for the dimensions of the cusps tend to sweep over the cusp promontories and destroy them. (Sinha-OEIS)
W74-04734

BEACH PROFILES OF A GEORGIA BARRIER ISLAND,
Georgia Univ., Sapelo Island. Marine Inst.
O. H. Pilkey, and D. M. Richter.
Southeastern Geology, Vol 6, No 1, p 11-19, 1965. 7 fig, 8 ref.

Descriptors: *Georgia, *Beaches, *Barrier islands, *Profiles, Seasonal, *Erosion, Storms.
Identifiers: Sapelo Island(GA).

Seasonal beach profiles were obtained from seven stations at the south end of Sapelo Island, Georgia, during 1963. Except for accretion at the extreme south tip of the island, most of the study area is being eroded. Unlike other beaches reported in the literature, the seasonal and observed storm changes of the Sapelo Island beach are slight. (Sinha-OEIS)
W74-04736

EOLIAN CROSS-BEDDING IN THE BEACH DUNE ENVIRONMENT, SAPELO ISLAND, GEORGIA,
Georgia Univ., Sapelo Island. Marine Inst.
L. S. Land.
Journal of Sedimentary Petrology, Vol 34, No 2, p 389-394, June 1964. 4 fig, 2 tab, 13 ref.

Descriptors: *Georgia, *Barrier islands, *Dunes, *Sediment transport, *Beaches, *Wind erosion, Aeolian soils, Stratification.
Identifiers: Sapelo Island(GA), *Eolian deposition.

The slipfaces of modern beach dunes on Sapelo Island, Georgia, are deposited by the prevailing, competent, dry winds rather than the high energy storm winds. High angle cross-bedding (cross-bedding which dips at least 30 deg) records the orientation of the prevailing winds. Approximately one-half the dune slipfaces and high angle cross-beds are stable at angles which exceed the angle of repose of dry sand, and cross-bed dips as high as 42 deg are stable in, and may be indicative of, the beach dune environment. Elongate sand grains are preferentially oriented parallel to the dip direction of the eolian cross-beds. (Sinha-OEIS)
W74-04737

HIGH-ANGLE BEACH STRATIFICATION, SAPELO ISLAND, GEORGIA,
Georgia Univ., Sapelo Island. Marine Inst.
J. H. Hoyt.
Journal of Sedimentary Petrology, Vol 32, No 2, p 309-311, June 1962. 3 fig, 2 ref.

Descriptors: *Georgia, *Beaches, Islands, Sand bars, *Stratification, *Barrier islands, *Slopes.
Identifiers: Sapelo Island(GA).

Foreshore sand bars at Sapelo Island typically have a steep landward slope. Deposition on this slope results in landward movement of the bar. The deposits are characterized by high-angle cross-stratification with dips as steep as 30 degrees. The dip of stratification formed on the steep landward face of bars of the foreshore beach reaches angles of 30 degrees. Bars up to 5 feet high are common features on the Sapelo Island Beach. Similarly formed stratification in ancient rocks may be measured with angles in excess of the 30 degree maximum observed at Sapelo Island if the beach surface is used as a horizontal datum. (Sinha-OEIS)
W74-04738

RHOMBOID RIPPLE MARK, INDICATOR OF CURRENT DIRECTION AND ENVIRONMENT,
Georgia Univ., Sapelo Island. Marine Inst.
J. H. Hoyt, and V. J. Henry, Jr.
Journal of Sedimentary Petrology, Vol 33, No 3, p 604-608, September 1963. 4 fig, 10 ref. NSF G-16426.

Descriptors: *Ripple marks, *Beaches, *Sands, *Sediment transport, *Waves(Water), *Littoral, Environments, *Currents(Water).
Identifiers: Wave backwash, Washover, Current flow, Rhomboid ripple marks.

The direction of current flow over the beach surface may be determined from the shape of rhomboid ripple marks. Characteristically these ripples are bowed in the direction of current flow and are pointed up-current. They are formed on the foreshore beach by wave backwash and by washover of low bars. The washover ripples result from thin sheets of water moving shoreward over the bars. At Sapelo Island, Georgia, rhomboid ripples are best developed on slopes of 1/2 to 2 deg. The beach material is predominately fine sand. There is a direct relation between the length-width ratio of rhomboid ripples and the slope of the beach surface. (Sinha-OEIS)
W74-04739

FLUME EXPERIMENTS ON SAND TRANSPORT BY WAVES AND CURRENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W74-04746

SUSPENDED SEDIMENT DUE TO WAVE ACTION,
Tokyo Univ., (Japan). Dept. of Civil Engineering.
M. Hom-ma, and K. Horikawa.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, Part 2, Chap 13, p 168-193, 1963. 19 fig, 2 tab, 28 ref.

Descriptors: *Waves(Water), *Sediment transport, *Powerplants, Cooling water, Ripple marks, *Shallow water.
Identifiers: Surface waves, Wave action, Suspended sediments, *Japan.

Field and laboratory investigations were made to determine the concentration patterns of suspended sediment due to action of surface waves. The distribution patterns of suspended sediment sampled at an open coast were studied in relation to functional and structural design of the cooling water intake system for the atomic power plant now under construction at the Pacific Ocean coast of Tokai, Ibaragi Prefecture, Japan. (Sinha - OEIS)
W74-04747

LABORATORY STUDY OF SCALE EFFECTS IN TWO-DIMENSIONAL BEACH PROCESSES,
Kyoto Univ., (Japan). Disaster Prevention Research Inst.
For primary bibliographic entry see Field 2L.
W74-04748

LONGSHORE CURRENTS IN ONE AND MULTI-BAR PROFILES RELATION TO LITTORAL DRIFT,
Florida Univ., Gainesville. Coastal Engineering Lab.
For primary bibliographic entry see Field 2L.
W74-04749

RHYTHMIC PATTERN OF LONGSHORE BARS RELATED TO SEDIMENT CHARACTERISTICS,
Tokyo Univ. (Japan). Dept. of Civil Engineering.
M. Hom-ma, and C. Sonu.
In: Proceedings of Eight Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 2, Chap 16, p 248-278, 1963. 29 fig, 2 tab, 9 ref.

Descriptors: *Currents(Water), *Waves(Water), Coasts, *Sediment transport, *Sand bars, Sand waves, *Shallow water, Shoals, *Littoral drift, Erosion, Deposition(Sediments).
Identifiers: *Japan, Beach cusps, Arcuate sand bars, En echelon san bars, Longshore currents, Longshore bars, Nearshore processes, Bottom topography, Shoreline waves, Giant ripple marks, Shoreline configuration.

The origin and movement are discussed of nearshore and underwater sand bars which are seen on aerial photographs taken on the coast of Japan. The bars are described as arcuate and in many cases are found en echelon or in parallel arrangements. The rhythmic bar pattern is correlated with dynamic or static factors such as shoreline configuration, shore face slope and deposits, bottom topography, transformation of incident waves, longshore currents and littoral drift. Implications for coastal engineering are suggested. (Sinha -OEIS)
W74-04750

LABORATORY APPLICATIONS OF RADIOISOTOPIC TRACERS TO FOLLOW BEACH SEDIMENTS,
Corps of Engineers, Washington, D.C. Beach Erosion Board.
N. E. Taney.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 2, Chap 17, p 279-303, 1963. 23 fig, 10 ref.

Descriptors: *Sediment transport, *Tracers, *Radioisotopes, *Beaches, *Waves(Water), *Currents(Water).
Identifiers: *Nearshore processes, Swash, Onshore-offshore movements.

Laboratory applications of the use of radioisotopic tracers for the study of sediment transport are described. Information is given on the equipment, the test basin and conditions and test operations. Results are given in time references. The results seem to indicate several mechanisms which had not formerly been detected. The first of these is a changing movement in the onshore-offshore direction. While there has been an enrichment of the activity by a seaward movement of sediment and tracer material, there are also periods of low activity or low counting rate. Seaward moving uncontaminated sediments could cover the activity and lower the count rate. However, the uncovering of the isotopic tracer as evidenced by the high rates negates such reasoning and points toward an oscillatory motion, onshore-offshore. Analysis of the elevation data fail to clarify this problem as the phenomenon is not recognized in those data. A second mechanism of somewhat similar nature has been discussed as the pulsating transport of sediments in the alongshore direction. It appears that slugs of activity move in the alongshore direction. These slugs are separated from each other by areas of low activity and and appear to form and move independently from each other. Finally the deep alongshore movement had not been determined before by elevation measurements although it was known to exist from earlier experimental work. It may be that this deep movement, in water depths of approximately 1 foot, is quite significant in that the magnitude of activity appears to be of the order of one-half that of the material moving in the zone of wave swash and one-fourth or less of that moving along the zone of wave plunge. (Sinha - OEIS)
W74-04751

A STUDY OF CRITICAL DEPTH AND MODE OF SAND MOVEMENT USING RADIOACTIVE GLASS SAND,
Ministry of Transportation, Yokosuka (Japan). Port and Harbour Research Inst.
S. Sato, T. Ijima, and N. Tanaka.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 2, Chap 18, p 304-323, 1963. 17 fig, 1 tab, 2 ref.

Descriptors: *Sediment transport, *Tracers, *Radioisotopes, Sands, *Waves(Water), *Ripple marks, Coasts, *Shallow water.
Identifiers: Japan, Breaker zone, Chromium 51, Surf zone, Wave action, Water depth, Nearshore processes.

The qualitative characteristics of sand movement in the offshore and the breaker zone and the relations of waves, depth and bottom materials are estimated from field experiments. Moreover, in the model test, the glass sand containing Cr-51 was used in order to study the mode of sand movement due to waves, in particular, the direction of ripple movement and sand transport. (Sinha - OEIS)
W74-04752

TRACING COASTAL SEDIMENT MOVEMENT BY NATURALLY RADIOACTIVE MINERALS,
California Univ., Berkeley. Coll. of Engineering.
A. M. Kamel, and J. W. Johnson.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 2, Chap 19, p 324-330, 1963. 4 fig, 4 ref.

Descriptors: *California, *Littoral drift, Sands, *Tracers, *Sediment transport, *Refraction(Water waves), *Waves(Water), Radioactivity techniques.
Identifiers: Heavy minerals, Thorium, Th-232, Wave action, Sorting.

Thorium (Th-232, 0.238 mev) was used as a natural tracer to determine the direction of littoral drift along the California coast. Radioactive thorium is added naturally at discrete places along the coast where rivers flowing through thorium rich granite outcrops reach the coast or where the thorium rich granite itself outcrops at the sea coast. The choice of the concentrations of both thorite and heavy minerals in parts per million and per cent, respectively, in sand samples collected at mid-tide from different places along the beach, are believed to be two good parameters for the study of the effect of progressive sorting and consequently the determination of the direction of littoral drift along the coast. (Sinha - OEIS)
W74-04753

SOME CHARACTERISTICS OF THE DUTCH COAST,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
T. Edelman, and D. N. Eggink.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 4, Chap 41, p 756-764, 1963. 5 fig.

Descriptors: *Waves(Water), *Currents(Water), *Tidal effects, Coasts, *Shallow water, *Sediment transport, Erosion, Deposition(Sediments).
Identifiers: Tidal currents, Wave action, Nearshore processes, Tidal range, *Netherlands.

Sediment transport along the Dutch coast is discussed in some detail. Consideration is given to the effect of waves and tidal currents on a non-disturbed coast. It is suggested that transport-capacity of a tidal current will increase with the tidal range. If the tidal range increases along the coast in the direction of propagation of the tidal wave, the coast will be eroded. A decreasing tidal range in that direction will cause an accretion. The transport-capacity of waves changes with the direction in which the waves approach the coast. This means that, if a dominant wave-direction exists, the curvature of the coast must be responsible for erosion or accretion by wave action. (Sinha - OEIS)
W74-04754

SIMILARITY IN SEDIMENT TRANSPORT DUE TO WAVES,
Hydraulics Research Station, Wallingford (England).
S. Yalin, and R. C. H. Russell.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 2, Chap 12, p 151-167. 11 fig, 5 ref.

Descriptors: *Waves(Water, *Sediment transport, Model studies.
Identifiers: Wave height, Orbital motion, Ripple height, Ripple length.

The movement by waves of cohesionless sediment lying on a horizontal bed is discussed. In particular the number of dimensionless parameters that are necessary to define the 2-phase motion at the bed is described, the specification of which would enable similarity to be obtained. In general four dimensionless parameters are necessary; but when the motion of the water at the bed can be adequately defined by an orbit length and a period, the two-phase motion can be described by the numerical value of three dimensionless parameters. This condition is satisfied when the wave-height is low, because then the orbital motion at the bed is sinusoidal and the drift velocity is negligible. Model and prototype experiments were conducted in a wave channel, using low waves, in which the scale for depth of water and for wavelengths was 3/10. The dependent parameters, three of which are sufficient to verify similarity of all aspects of the phenomenon were chosen to be ripple height, ripple length and transport of sediment. The identity of the dimensionless numbers signifying the ripple height, ripple length and transport in model and prototype is proof that similarity had been obtained. (Sinha - OEIS)
W74-04755

DRASTIC BEACH CHANGES IN A LOW-ENERGY ENVIRONMENT CAUSED BY HURRICANE BETSY,
Florida State Univ., Tallahassee. Oceanographic Inst.
D. A. Warnke, V. Goldsmith, P. Grose, and J. J. Holt.
Journal of Geophysical Research, Vol 71, No 6, p 2013-2016, April 15, 1966. 3 fig, 2 tab, 6 ref.

Descriptors: *Hurricanes, *Beaches, *Erosion, *Sedimentation, Wave pile-up, *Florida, Coasts, *Tidal effects, Shoals, Storms.
Identifiers: Low energy environments, Wave action, Panama City(FL), Nearshore processes.

A number of beach surveys were made in the course of terrain-analytical studies in the Big Bend area of Florida. The area of Alligator Spit and the islands to the southwest have been classified as a low-energy environment on the basis of estimates of average breaker height. The rate of erosion was greatest during the passage of hurricanes through the Gulf of Mexico, but it was not necessarily directly related to the passage of hurricanes through the Big Bend area. Beach changes associated with the passage of hurricane Betsy (September 8-10, 1965) through the Gulf of Mexico are described quantitatively. These changes are illustrated in the maps and diagrams. It is possible that, because of the east-west path of the hurricane through the Gulf of Mexico, wind-driven water from the eastern sectors of the hurricane was piled up against the beaches at Alligator Spit, resulting in spectacular high tides - about 75 cm above the expected highs. These high tides allowed even moderate wave action to influence a region of the beach which usually is above wave action. Reconnaissance trips to various localities near Alligator Spit and the Panama City beaches immediately after hurrican Betsy revealed pronounced erosion and retreat of the forward dune aprons, where these are present. The eroded material everywhere seemed to be accumulated in widespread shoals near shore. The over-all landward retreat of the forward dune aprons, and the relatively constant widths of the beaches through time, indicate, among other factors, that most of the beach loss is permanent. (Sinha - OEIS)
W74-04756

DEVELOPMENT AND GEOLOGIC SIGNIFICANCE OF SOFT BEACH SAND,
Georgia Univ., Sapelo Island. Marine Inst.
J. H. Hoyt, and V. J. Henry, Jr.
Sedimentology, Vol 3, p 44-51, 1964. 4 fig, 1 tab, 8 ref.

Descriptors: South Carolina, Georgia, Florida, *Beaches, *Dunes, *Sands, *Bubbles, Environment, *Southeast U.S.
Identifiers: *Soft beach sand, Eolian deposits.

The firmness of sand beaches is variable. Some areas of soft sand are due to a spongelike, bubble development up to 16 inches in thickness in the upper part of the beach. The bubbles are formed by air trapped in sand when the area is flooded by the rising tide. Air remains in the sand as bubbles which tend to enlarge to as much as 1/2 inch in diameter with repeated draining and flooding. A critical factor in the development of the bubbles appears to be the dryness of the sand deposit. Eolian deposits on the upper beach are particularly susceptible to bubble development. When exposed on the beach surface, the bubbles result in depressions superficially similar to raindrop imprints. The development and subsequent compaction of the bubbles may leave a permanent record by disrupting the laminae and resulting in a more homogenous appearing bed. The orientation of elongate sand grains is also markedly affected. Bubbles, bubble depressions, disrupted laminae and grain reorientation in addition to altering the original properties of the sand deposit may be useful in establishing the depositional environment. (Sinha - OEIS)
W74-04757

WAVES GENERATED BY HORIZONTAL MOTION OF A WALL,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 8B.
W74-04760

PHENOMENA AFFECTING IMPROVEMENT OF THE LOWER COLUMBIA ESTUARY AND ENTRANCE,
Corps of Engineers, Portland, Oreg. Special Projects Investigation Section.
For primary bibliographic entry see Field 2L.
W74-04763

NUCLEONIC SEDIMENT CONCENTRATION GAUGE - COMPARISON OF TRANSMISSION AND SCATTERING MODES,
Bhabha Atomic Research Centre, Bombay (India), Isotope Div.
K. Krishnamurthy, S. M. Rao, and R. Rajagopalan.
International Journal of Applied Radiation and Isotopes, Vol 24, No 11, p 579-583, October 1973. 3 fig, 1 tab, 7 ref.

Descriptors: *Suspended solids, *Measurement, *Instrumentation, *Sediments.
Identifiers: *Nucleonic gauge, Counting, Scattering mode, Transmission mode, Detection limits.

Recent interest in the development of nucleonic gauges for measuring the concentration of suspended sediments in streams prompted this comparison of the transmission and scattering modes of operation for such instruments. It was found that there is hardly any difference in the performance of the gauge in either mode of operation. This could be predicted by the theory as well. The standard deviation under the experimental conditions corresponds to about 700-750 ppm. Besides the fact that there is little or no difference in both types of gauges, since scattering of low energy gamma radiation of 60 keV does not appreciably alter the photon energy even under multiple scattering (mean free path:5 cm), the dependence on the chemical nature of the sediment will be similar to that with the original energy gamma rays. It was also concluded that the nucleonic sediment concentration gauge with Am-241 may not be good for measurement of concentrations below 3000 ppm. (Mortland-Battelle)

W74-04774

A SYRINGE GAS-STRIPPING PROCEDURE FOR GAS-CHROMATOGRAPHIC DETERMINATION OF DISSOLVED INORGANIC AND ORGANIC CARBON IN FRESH WATER AND CARBONATES IN SEDIMENTS,
Fisheries Research Board of Canada, Vol 30, No 10, p 1441-1445, October 1973. 2 fig, 1 tab, 9 ref.
For primary bibliographic entry see Field 5A.
W74-04788

THE CALCULATION OF CRITICAL DISCHARGE VELOCITY OF STREAMS IN UNIFORM FLOW AND THE TRANSPORTED SEDIMENT SIZE,
M. S. Quraishy.
Sind University Research Journal (Science Series) Vol 5, No 2, p 215-220, 1971. 1 fig, 3 ref.

Descriptors: *Sediment transport, *Discharge(Water), *Bed load, *Equations, Settling velocity, Depth, Particle size, Shear stress, Viscosity, Channel morphology.

Critical discharge velocity for initiation of bed load movement is the basis of nondimensional relations by which the various critical discharge data can be correlated and interpreted. However, the form of these expressions makes it difficult to calculate the particle sizes of the corresponding terminal velocities. A method is given to overcome this difficulty. (Knapp-USGS)
W74-04800

THE PROBLEM OF CRITICAL DISCHARGE IN SEDIMENT MOTION,
Planning Commission, Karachi (Pakistan). Water and Power Section.
M. S. Quraishy.
Engineering News, Vol 9, No 2, June 1964. 8 p, 2 fig, 12 ref.

Descriptors: *Sediment transport, *Discharge(Water), *Bed load, *Equations, Settling velocity, Depth, Particle size, Shear stress, Viscosity, Channel morphology.

Nondimensional functional relations correlate the product of critical discharge per unit width and the hydraulic gradient or slope of streams in uniform flow with sediment characteristic size. The solution of critical discharge presumes a knowledge only of the interrelation between the critical shear stress velocity and the mean velocity. The various relations for the critical or threshold condition, by the definition of general motion, are also the relations for correlating data on initiation of bed configurations. (Knapp-USGS)
W74-04801

RESPONSE AND RECOVERY OF A PIEDMONT WATERSHED FROM TROPICAL STORM AGNES, JUNE 1972,
Maryland Geological Survey, Baltimore.
J. E. Costa.
Water Resources Research, Vol 10, No 1, p 106-112, February 1974. 7 fig, 2 tab, 13 ref. USGS Grant 14-08-0001-G-38.

Descriptors: *Floods, *Hurricanes, *Atlantic Coastal Plain, *Maryland, *Erosion, Geomorphology, Channel morphology, Rainfall-runoff relationships, Stage-discharge relations.
Identifiers: Tropical storm Agnes(1972).

Tropical storm Agnes generated flooding with a recurrence interval much greater than 100 years in a Piedmont watershed: 633 cfs per sq mi from 60 sq mi. Deposits on floodplains were scarce. Deposition occurred where tributaries joined the main channel, across meander bends, and below valley constrictions such as roads and bridges. Despite the magnitude of the rainfall and flooding there were no slope failures in the basin. The only modifications to the watershed were observed in the lowlands along the main channels. Channel widening was the most spectacular modification. Within 1 year of the flood, channel cross sections were well along recovery. Meandering reaches of the channel recovered faster than straight reaches. The Agnes flood is nearly the largest ever reported from a Piedmont watershed of this size. Large floods in the Piedmont apparently play a minor role in shaping the landscape, whereas large floods in the Blue Ridge/Valley and Ridge and Appalachian Plateau provinces, and consequent slope failure, are very active landscaping agents. (Knapp-USGS)
W74-04805

PROPAGATION OF A FINITE-AMPLITUDE SURFACE WAVE WITH ALLOWANCE FOR RANDOM IRREGULARITIES OF THE BOTTOM,
Nauchno-Issledovatelskii Radiofizicheskii Institut, Gorkii (USSR).
Y. M. Pelinovskiy.
Atmospheric and Oceanic Physics, Vol 7, No 11, p 804-805, May 1972. 1 fig, 9 ref. Trans. from Russian.

Descriptors: *Shallow water, Bores, *Waves(Water), *Gravity waves, *Winds, Coasts.
Identifiers: *Solitary waves, *Bottom topography, Surface waves.

The behavior of the wave surface was considered in the presence of random irregularities of the bottom. Using the method of characteristics, equations of the 'shallow water' theory are solved. This solution holds up to the point where the discontinuity occurs. To find the coordinate at which the shock wave forms involves solving the indirect variational problem for a function of the depth function. At a random distribution of depths, the problem can be reduced to the known problem of whether a Brownian particle can reach the boundaries of some region. The 'shallow water' theory is asymptotic. At sufficiently small amplitudes the waves are not overturned and the bore disintegrates into a succession of solitary waves. The presence of an entire region of random generation of solutions is an additional source for generation of random oscillations in the coastal zone, attributed at present to nonlinear interaction between gravity waves and wind. (Sinha-OEIS)
W74-04841

SUSPENDED AND BEDLOAD SEDIMENT TRANSPORT IN THE SNAKE AND CLEARWATER RIVERS IN THE VICINITY OF LEWISTON, IDAHO,
Geological Survey, Boise, Idaho.
W. W. Emmett, and H. R. Seitz.
Geological Survey Basic-data Report, 1973. 78 p, 26 fig, 16 tab, 4 ref.

Descriptors: *Baseline studies, *Sediment transport, *Design criteria, *Levees, *Idaho, Hydraulic structures, Engineering structures, Data collections, Hydrologic data, Streamflow, Runoff, Sedimentation, Bed load, Computer programs, Forecasting, Planning.
Identifiers: *Snake River(Ida), Clearwater River(Ida).

Backwater on the Snake River and Clearwater River arms of the pending (1975) impoundment of water in back of Lower Granite Dam will necessitate construction of levees in the Lewiston, Idaho, area. Sediment transport and bedload data are presented for use in computer modeling aimed at defining design height of the levees. Information is summarized from data collected from March 1972 through June 1973. For both rivers, the volumes of runoff in the spring of 1972 were considerably greater than normal, and peak flows were moderately higher than normal. Both volumes of runoff and rates of peak flow were considerably less than normal during the spring of 1973. Thus, data are included for a wide range in values of streamflow. (Woodard-USGS)
W74-04846

2K. Chemical Processes

DETERMINATION OF THE COMPLEXING CAPACITY OF NATURAL WATER,
North Carolina State University at Raleigh. Department of Chemistry.
K. W. Hanck, and J. W. Dillard.
Available from National Technical Information Service as PB-227 874 $4.00 in paper copy, $1.45 in microfiche. Water Resources Research Institute of University of North Carolina UNC-WRRI Report No 85, December 1973. 73 p, 10 fig, 15 tab, 45 ref, 3 append. OWRR A-052-NC(1). 14-31-0001-3533.

Descriptors: *North Carloina, Volumetric analysis, *Polaragraphic analysis, *Analytical techniques, Metals, EDTA, Ions, Pollutant identification, Cobalt.
Identifiers: Neuse River(N.C.), *Voltammetry(Anodic stripping), Complexing capacity, *Ligands, *Metal ions.

An analytical procedure for chemically measuring the complexing capacity (ability of a water to complex metal ions) of natural water is developed and tested. The procedure can be used in evaluating the role of natural complexing agents in the transport, toxicity, and availability of trace metal ions in natural waters. Three methods were evaluated, two based on micro scale complexometric titration using anodic stripping voltammetry, and a third, the recommended procedure, involving chemical conversion of the ligands (substances capable of forming metal complexes with metal ions) in the sample to the corresponding cobalt (III) complex. Differential pulse polarography was used to monitor the decreases in cobalt (III) concentration after production of the cobalt (III) complexes and hence the complexing capacity of the sample. This procedure has a detection limit of 0.6 micromoles of ligand per liter. (McJunkin-North Carolina)
W74-04312

GEOCHEMISTRY OF PERMAFROST AND QUATERNARY STRATIGRAPHY,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 2C.
W74-04364

IONIC MOBILITY IN PERMAFROST,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04382

THE NEED OF GEOLOGICAL INVESTIGATIONS FOR THE DEVELOPMENT OF THE GROUND WATER RESOURCES OF THE REPUBLIC OF KOREA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W74-04466

EVALUATION OF THE GROUND-WATER SUPPLY AT EIGHT SITES IN GLACIER NATIONAL PARK, NORTHWESTERN MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 2F.
W74-04469

MASS SPECTROMETRY AND INHOMOGENEOUS ION OPTICS,
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 5A.
W74-04475

QUANTITY AND CHEMICAL QUALITY OF LOW FLOW IN THE EAST FORK SAN JACINTO AND WEST FORK SAN JACINTO RIVERS NEAR HOUSTON, TEXAS, JUNE 24, 26, 1969.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 5B.
W74-04481

EVALUATION AND SIMULATION OF CHEMICAL-QUALITY DATA FOR FIVE MONTANA SAMPLING STATIONS.
Geological Survey, Helena, Mont.
L. R. Frost, Jr.
Open-file report, 1974. 50 p, 17 fig, 17 tab, 9 ref.

Descriptors: *Water quality, *Water chemistry, *Simulation analysis, *Montana, Sampling, *Hydrologic data, Regression analysis, Computer programs.
Identifiers: *Yellowstone River basin(Mont).

Chemical water-quality data for five daily sampling stations in Montana were analyzed to determine relationships existing between specific conductance or streamflow and the concentrations of the major inorganic constituents. Regression parameters were obtained from data collected from 1961 to 1970. Comparison of laboratory data with simulated data for monthly constituent loads at one station indicated that the more abundant constituents could generally be simulated within 15% of the values computed from laboratory data. Agreement between discrete sample data and corresponding simulated data indicated that the same general agreement could exist for the remaining four stations. (Knapp-USGS)
W74-04484

SURFACE-WATER AVAILABILITY, LAUDERDALE COUNTY, ALABAMA.
Geological Survey, University, Ala.
For primary bibliographic entry see Field 2E.
W74-04494

RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF CIMARRON COUNTY, OKLAHOMA.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 4B.
W74-04495

ENVIRONMENTAL CHEMISTRY: AIR AND WATER POLLUTION.
Weber State Coll., Ogden, Utah. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W74-04513

VISCOSITY MEASUREMENTS OF WATER IN REGION OF ITS MAXIMUM DENSITY.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
D. J. Kingham, W. A. Adams, and M. J. McGuire.
Journal of Chemical and Engineering Data, Vol 19, No 1, p 1-3, January 1974. 2 fig, 3 tab, 27 ref.

Descriptors: *Water properties, *Viscosity, *Density, *Thermodynamic behavior, Temperature, Thermal properties, Equations.

The viscosity of water was measured at closely spaced intervals in steps of 0.5C over the temperature range 0-10C with a precision of plus or minus 0.014%. Fitting the data to a combined Arrhenius-Vogel equation revealed no thermal anomalies in the rheological behavior of water at the temperature of its maximum density. The tabulated data span the temperature range that is of considerable environmental importance. They should also serve to quiet controversies over previously reported literature values of water viscosities which had a precision of plus or minus 0.6% at best. (Brown-IPC)
W74-04518

INFLUENCES OF SOIL DENSITY, CLAY SILT AND HUMUS CONTENT ON MEASUREMENTS OF SOIL WATER BY NEUTRON GAUGES. (IN GERMAN).
Technische Universitaet, Munich (West Germany). Institut fuer Pflanzenbau und Pflanzenzuechtung.
For primary bibliographic entry see Field 2G.
W74-04556

OVERGROWTH OF OOZE IRON-MANGANESE MICROORGANISMS STUDIED BY ELECTRON MICROSCOPY. (IN RUSSIAN).
Akademiya Nauk SSSR, Leningrad. Institut Ozerovedeniya.
For primary bibliographic entry see Field 5A.
W74-04558

CHEMICAL QUALITY OF STREAMS, ALLEGHENY RIVER BASIN AND PART OF THE LAKE ERIE BASIN, NEW YORK.
Geological Survey, Albany, N.Y.
M. H. Frimpter.
New York State Department of Environmental Conservation, Basin Planning Report ARB-3, 1973. 79 p, 38 fig, 8 tab, 27 ref.

Descriptors: *Water quality, *Chemical analysis, *New York, Streams, *River basins, Precipitation(Atmospheric), Streamflow, flow rates, Low flow, Groundwater movement, Hydrologic cycle, Hydrologic data, Sampling, Water chemistry, Water analysis, Correlation analysis, Geology, Water pollution sources, Thermal pollution, *Lake Erie.
Identifiers: *Allegheny River Basin(N Y).

Data are presented from an investigation of chemical quality of streams in the Allegheny River basin and part of the Lake Erie basin, New York, in 1967. The study area includes about 2,200 square miles in the southwestern corner of New York State and lies almost entirely in the Allegheny Plateau physiographic province. The area can be divided into four regions on the basis of chemical quality of streamflow. Streams in Region I drain a nonglaciated area and contain a soft (range of hardness, 20-57 mg/liter as CaCO3) calcium bicarbonate type water. Water in streams of Region II, a glaciated region, has hardness ranges from 61 to 180 mg/liter, and the water is calcium bicarbonate type. Water in streams of Region III, on the Lake Erie Plain, has hardness ranging from 103 to 221 mg/liter. Water type varies and may be calcium bicarbonate, calcium sulfate, or a mixed calcium bicarbonate and sulfate type. Dissolved-solids content of streams in Regions I, II, and III is generally less than 500 mg/liter at low flow. Streams in Regions I, II, and III are unaffected by oilfield brine. Region IV encompasses the drainage areas of oilfields where the stream water is usually sodium chloride type. Hardness of water in Region IV ranges from 84 to 2,100 mg/liter and dissolved-solids content ranges from 70 to 7,480 mg/liter. (Woodard-USGS)
W74-04593

AVAILABILITY OF GROUND WATER IN THE WINNSBORO AREA, LOUISIANA.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 4B.
W74-04596

THE USE OF COMPUTER SIMULATIONS FOR SYSTEMS ECOLOGICAL STUDIES IN THE BALTIC.
Stockholm Univ. (Sweden). Asko Lab.
For primary bibliographic entry see Field 5B.
W74-04634

COMMENTS ON VERONIS' PAPER, 'ON PROPERTIES OF SEAWATER DEFINED BY TEMPERATURE, SALINITY, AND PRESSURE'.
Moscow State Univ. (USSR). Dept. of Oceanology.
O. I. Mamayev.
Journal of Marine Research, Vol 31, No 1, p 90-91, 1973. 3 ref.

Descriptors: Oceanography, *Mathematical models, *Temperature, *Salinity, *Density, *Water properties, Model studies, Equations, Graphical analysis, Pressure, Water pressure, *Sea water.

The orthogonal variable to the potential density curve which Veronis (1972) (See W73-13477) suggested as a useful complement to the information contained in potential density, was originally proposed by Mamayev in 1962. In that paper the existence of the line integral along the temperature - Salinity (T-S) curve in the T-S plane was demonstrated; and the integral was shown to be equal to the definite integral of the main part of vertical stability, E. The original theoretical problem was further developed by Mamayev in 1970. Equations showing the existence of the variable on the T-S plane, orthogonal to the density are presented, which are analogous to the Cauchy-Riemann equations. (Jerome-Vanderbilt)
W74-04658

THIN-LAYER AND GAS-CHROMATOGRAPHIC DETERMINATION OF PHENOLS PRESENT IN WATER. (IN GERMAN).
Mainz Univ. (West Germany). Hygiene Institut.
For primary bibliographic entry see Field 5A.
W74-04684

USE OF A SILVER-SULFIDE ELECTRODE FOR STANDARDIZING AQUEOUS SULFIDE SOLUTION IN DETERMINING SULFIDE IN WATER.
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W74-04777

2L. Estuaries

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME I, PRINCIPLES OF COMPUTATION.
RAND Corp., Santa Monica, Calif.
J. J. Leendertse, R. C. Alexander, and S. K. Liu.
Available from National Technical Information Service as PB-227 957 $3.75 in paper copy, $1.45 in microfiche. Completion report, R-1417-OWRR, December 1973. 57 p, 24 fig, 14 ref, 2 append. OWRR-C-4261(9040)(1). 14-31-0001-9040.

Descriptors: *Estuaries, *Mathematical models, *Numerical analysis, Tides, Fluid dynamics, Computer models, Coastal engineering, Simulation analysis, Unsteady flow, Model studies, Finite element analysis.
Identifiers: *Three dimensional flow.

Principles of computation are described for a three-dimensional model of estuaries, bays, and coastal seas in which nonisotropic density conditions exist. Numerical integration of the finite difference equations for motion, transport, and continuity are used. In these equations the vertical momentum exchange is quadratically related to horizontal velocities, and the effects of vertical accelerations are neglected. The computational method has been tested on a number of basins with boundaries of increasing complexity. A computation for a large lake with irregular boundaries and depth with a horizontal grid of 1000 points and 8 layers took 30 minutes on an IBM 360-91 for a real-time simulation of 67 hours in 4000 time steps. Results indicate that three-dimensional flows can be computed effectively according to the method described.

W74-04301

THE RESPONSE TO TIDAL FLUCTUATIONS OF A LEAKY AQUIFER SYSTEM,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W74-04308

ESTUARIES,
W. M. Cameron, and D. W. Pritchard.
In: The Sea, Vol 2, Composition of Sea-water. M.N. Hill, editor Chap. 15, p 306-324, 1963. 2 fig, 23 ref.

Descriptors: *Estuaries, Bays, Inlets(Waterways), Gulfs, Sounds, Circulation, *Stratification, Fjords, *Water circulation.
Identifiers: Flushing, Embayments, Kinematics.

An estuary is a semi-enclosed coastal body of water having a free connection with the open sea and within which the sea-water is measurably diluted with fresh water deriving from land drainage. Traditionally the term 'estuary' has been applied to the lower reaches of a river into which sea-water intrudes and mixes with the fresh water draining seaward from the land. The term has been extended to include bays, inlets, gulfs and sounds into which several rivers empty and in which the mixing of fresh and salt water occurs. A discussion is presented of the circulation patterns which occur in tributary embayments to estuaries, which in regard to the increment of fresh water added within the embayment would not be classified by definition as estuaries, but in which the circulation is definitely related to the esturarine character of the adjacent water body. Many of the concepts developed here for estuaries will apply, with certain appropriate modifications, to non-estuarine coastal embayments and even to segments of the coast and of the open ocean. (Sinha-OEIS)
W74-04321

MULTI-DIMENSIONAL ASPECTS OF EDDY DIFFUSION DETERMINED BY DYE DIFFUSION EXPERIMENTS IN COASTAL WATERS (SUMMARY),
Loyola Univ., Los Angeles, Calif.
J. E. Foxworthy, R. B. Tibby, and G. Barsom.
In: Symposium on Diffusion in Oceans and Freshwater, Palisades, NY., August 31-September 1, 1964, T. Ichiye, editor, p 71-73, 1964.

Descriptors: *California, Coasts, *Dye dispersion, *Diffusion, *Statistical models, Model models.
Identifiers: Nearshore, Eddy diffusion, Wind speed.

Results are presented of a series of experiments on multi-dimensional diffusion conducted in the near shore coastal areas off Southern California. Experiments are described on two- and three-dimensional relative diffusion of a patch of dye released from an instantaneous point source. By utilizing a continuous flow type fluorometer and specially designed underway sampling equipment, it was possible to ascertain the average spacetime distribution of fluorescent dye concentration in a diffusing patch. From these data the rates of diffusion (in terms of the mean square dispersion) were determined in the vertical and horizontal coordinate directions. The decrease in maximum dye concentrations with time was proportional to the amount of dye initially released and inversely proportional to the square root of the overall rate of diffusion, as predicted by several statistical models of two- and three-dimensional relative diffusion. (Sinha-OEIS)
W74-04322

HARMONIC GENERATION OF SHALLOW WATER WAVES OVER TOPOGRAPHY,
Florida State Univ., Tallahassee. Geophysical Fluid Dynamics Inst.
For primary bibliographic entry see Field 2E.
W74-04323

THE SOLITARY WAVE,
For primary bibliographic entry see Field 8B.
W74-04326

MIXING PROCESSES,
For primary bibliographic entry see Field 5B.
W74-04327

A REVIEW OF OCEANOGRAPHIC VARIABLES AND THEIR ANALYSES AND PREDICTIONS OVER THE CONTINENTAL SHELF,
Fleet Numerical Weather Facility, Monterey, Calif.
T. Laevastu, and G. M. Griswold.
In: Proceedings U.S. Navy Fifth Symposium, Military Oceanography, Panama City, Florida, May 1-3, 1968, Oceanographer of the Navy, Vol 1, p 17-25, 1968. 1 tab, 4 ref.

Descriptors: *Coasts, Runoff, *Forecasting, Sound waves, Shallow water, Tides, Tidal currents, Winds, Temperature, Salinity, Marine biology, Bathymetry, *Continental shelf, Reviews.
Identifiers: *Sea-air interaction, *Sea-land interaction.

The factors and dynamic processes affecting the oceanographic variables in coastal waters are categorized and quantitatively evaluated. Processes in coastal and offshore regions are compared and the magnitudes of changes in environmental properties are listed. A quantitative description is given of the coastal sea-air interactions and sea-land interactions, including runoff problems. General analyses and forecasting models for oceanographic variables in coastal waters are presented, based on the above background knowledge. The sea-bottom interactions and the characteristics of marine biology, in coastal waters are summarized. A brief review of the effects of coastal environment on sound propagation is also given. (Sinha-OEIS)
W74-04329

HURRICANE STORM SURGE CONSIDERED AS A RESONANCE PHENOMENON,
Waterloopkundig Laboratorium, Delft (Netherlands).
G. Abraham.
In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, the Engineering Foundation, Vol 2, Chap 31, p 585-602, 1961. 13 ref. NSF 4630.

Descriptors: *Hurricanes, *Storm surge, *Seasonance, Model studies, Gravity waves, *Waves(Water), *Surges, Coasts, *Tsunamis, Shallow water.

A model study was performed of the water gravity waves generated by a circular local disturbance of pressure, advancing with constant velocity over the surface of water of constant depth. The results indicate that under critical conditions a resonance type phenomenon occurs for which the associated wave heights have a maximum value. The resonant conditions may be an important factor for the generation of the surge due to hurricanes that approach the coast perpendicularly. The following conclusions may be drawn: (1) A period of time of the order of magnitude of one hour may be considered to be sufficient for the development of three dimensional shallow-water maxima in nature. (2) Assuming that sufficient time is available for their development, three dimensional shallow-water maxima up to three times the static water displacement may be considered to be possible in nature. A shallow-water maximum of three times the static water displacement, combined with total reflection against the coast, could explain storm surges up to six times the static water displacement. The shallow-water maxima, combined with the affects of the coast could even explain storm-surges higher than six times the static water displacement. (Sinha-OEIS)
W74-04332

A STUDY OF DIFFUSION IN AN ESTUARY,
Navy Hydrographic Office, Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-04333

MECHANICAL BYPASSING OF LITTORAL DRIFT AT INLETS,
Corps of Engineers, Washington, D.C. Beach Erosion Board.
G. M. Watts.
Journal of the Waterways and Harbors Division, American Society of Civil Engineers, Vol 88, No WW1, Proceedings Paper 3058, p 83-99, February 1962. 7 fig, 19 ref.

Descriptors: *Coasts, *Littoral drift, *Inlets(Waterways), *Sediment transport, *Coastal structures, Geomorphology.
Identifiers: *Sand bypassing, Shoaling.

A brief examination of the general processes of littoral drift movement at uncontrolled and controlled coastal inlets is presented. The principal factors are noted that should be evaluated when mechanical bypassing of drift past an inlet is considered. The general techniques of bypassing are examined, and the types of plants used in the operation are described. A summary is given of all completed and active bypassing projects in the United States. Some of the more important factors that need to be considered in the planning of a bypassing system are geomorphology, subsurface conditions, water level variations, winds, waves, allowable wave runup and overlapping, shore line and offshore depth changes, littoral drift, the effects of nearby inlets or other structures, prior constructive works and their effects, the zone for collecting the littoral drift and placement of drift downdrift of inlet, availability of materials for construction and maintenance, effective time of operation of bypassing system, and comparative costs. (Sinha-OEIS)
W74-04337

WAVES IN SHOALING WATER,
For primary bibliographic entry see Field 8B.
W74-04338

SHORES AND SHORE PROCESSES,
R. L. Wiegel.
In: Oceanographical Engineering, Chapter 14, p 341-383, 1964. 37 fig, 101 ref. Prentise Hall, New York, NY, Price: $24.75.

Descriptors: Shores, *Beaches, Environment, Sediment, *Sediment transport, *Littoral drift, *Estuaries, *Refraction(Water waves), Waves(Water), Currents(Water), Sedimentation.
Identifiers: Diffraction.

Current understandings on shores and shore processes are described. Subjects treated are: classification (genetic) of shores, descriptive classification, the shore and its environment (factors affecting beach characteristics), description of beach material, beach configuaration, source of material, stability of beaches, longshore drift, and estuary entrances. (Sinha-OEIS)
W74-04339

A REFRACTION STUDY AND PROGRAM FOR PERIODIC WAVES APPROACHING A SHORELINE, AND EXTENDING BEYOND THE BREAKING POINT,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 8B.

W74-04340

HURRICANE TIDE PREDICTION FOR NEW YORK BAY,
Texas A and M Univ., College Station. Dept. of Oceanography and Meteorology.
B. W. Wilson.
In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, The Engineering Foundation, Vol 2, Chap 30, p 548-584, 1961. 20 fig, 1 tab, 33 ref. N7 onr 48702, N onr 2119 (02).

Descriptors: New York, Surges, *Storm surge, *Hurricanes, *Bays, Gravity waves, Forcing function, *Waves(Water), *Tides, Pressure, *Winds.
Identifiers: *New York Bay, Edge waves.

The solution is presented of the problem of correlating, on a two-dimensional basis, the meteorological parameters of several off-shore storms with the known surge induced by them in New York Bay and with the application of the results to the prediction of likely effects of a design hurricane of given strength traversing a given path at a given speed. A recursion formula is evolved, using the method of finite differences for time increments of 1/3 hour, which relates tide elevation at the bay-mouth with two values of the elevation at 1/3 and 2/3 hour earlier and with values of wind-stress and pressure-gradient driving-force components at times earlier by the periods taken for free long gravity waves to travel from the stations to the bay-mouth. The formula includes a cumulative forcing function term which allows for the geostrophic influence of the earth's rotation and also for an 'edge-wave' effect northward along the eastern seaboard. Moreover it takes into account the observed tendencies of hurricane storm tides in New York Bay to develop resurgences at periods of 7 hours with decay rates of 50% amplitude decrease per cycle. The coefficients of the 'forcing functions', determined by correlation, tend to represent the storm size and speed and also the dynamic augmentation of the forced wave. Predicted maximum storm tide heights are in fair agreement with crude empirical estimates based on central pressures within the hurricanes. (Sinha-OEIS)
W74-04343

ESTUARINE CURRENTS AND TIDAL STREAMS,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
R. Agnew.
In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, The Engineering Foundation, Vol 2, Chap 28, p 510-535, 1961. 17 fig, 20 ref.

Descriptors: Circulation, *Currents(Water), *Estuaries, *Density currents, *Tidal streams, *Tidal effects, Turbulence, Equations of motion, Density, *Mixing.
Identifiers: Tidal range.

Estuarine processes are analyzed in some detail. In particular, consideration is given to density distribution, mean velocities of circulation, turbulence measurements, equations of motion, velocity distribution in density current, and the effects of the neglected inertia term in the dynamic equation. The case of a tidal estuary, which may be treated as a channel closed at one end and open to the sea at the other end, involves the combination of an incident wave whose amplitude decreases exponentially in the direction of propagation (from open to closed end), and a reflected wave whose amplitude decreases exponentially from the closed end to the sea. A general solution is very difficult, but the direction of net movement in a tidal estuary may be inferred from available data on the variation of tidal elevations and mean velocities along the estuary. (Sinha-OEIS)

W74-04344

SEDIMENT MOVEMENT AT INDIAN PORTS,
Birla Inst. of Tech., Ranchi (India). Dept. of Civil Engineering.
M. Manohar.
In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, The Engineering Foundation, Vol 1, Chap 21, p 342-374, 1961. 20 fig, 10 ref.

Descriptors: Coasts, *Sediment transport, Ports, Harbors, *Estuaries, *Beaches, Erosion, Deposition(Sediments), *Winds, *Littoral drift, *Monsoons, Seasonal, Asia.
Identifiers: *India, Accretion.

Sediment movement along the east and west coasts of India is described. The information presented should be useful in many countries where investigations of the coastlines are far from adequate. The characteristics of the east and west coast features are different in nature with respect to the wind forces, erosion, accretion, and littoral drift. Special consideration is given to the different wind systems with emphasis on the effects of the monsoons. It is indicated that with each type of coast, engineering works will differ. A study of coastal sediment movement is important since what may be beneficial to a harbor may be harmful for preservation of a coastal strip. Improper use of protective structures may accelerate changes along the shoreline rather than stop them. (Sinha-OEIS)
W74-04345

DYNAMICS AND MORPHOLOGY OF SEA COASTS.
National Science Foundation, Washington, D.C. Special Foreign Currency Science Information Program.
For primary bibliographic entry see Field 2J.
W74-04425

SOME RESULTS OF REGIONAL COASTAL INVESTIGATIONS IN THE USSR,
For primary bibliographic entry see Field 2J.
W74-04426

DEVELOPMENTAL HISTORY AND PRESENT-DAY DYNAMICS OF THE CHUSHKA SPIT,
For primary bibliographic entry see Field 2J.
W74-04428

SOME DATA ON THE POST-GLACIAL EVOLUTION OF KARKINIT BAY AND THE ACCUMULATION OF BOTTOM SEDIMENTS WITHIN IT,
For primary bibliographic entry see Field 2J.
W74-04429

MORPHOLOGY AND EVOLUTION OF ALAGOON COAST ON SAKHALIN,
For primary bibliographic entry see Field 2J.
W74-04433

CERTAIN ASPECTS OF THE INTERACTION BETWEEN WAVE FLOW AND A DEFORMABLE BOTTOM AT LOW VELOCITIES,
For primary bibliographic entry see Field 2J.
W74-04435

THE POSSIBILITY OF FORECASTING TRANSIENT COASTAL RELIEF CHANGES BY WAVES,
For primary bibliographic entry see Field 2J.
W74-04436

THE POSSIBILITY OF PREDICTING LONGSHORE CURRENTS IN TIDELESS SEAS,
For primary bibliographic entry see Field 2J.
W74-04439

THE ROLE OF EOLIAN PROCESSES IN THE DYNAMICS OF A SHALLOW ACCUMULATION COAST,
For primary bibliographic entry see Field 2J.
W74-04440

GALVESTON BAY HURRICANE SURGE STUDY: REPORT 2. EFFECTS OF PROPOSED BARRIERS ON TIDES, CURRENTS, SALINITIES, AND DYE DISPERSION FOR NORMAL TIDE CONDITIONS--APPENDIX B: CALIBRATION TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W74-04573

WAVES OFF BENGHAZI HARBOUR - LIBYA,
Halcrow (William) and Partners, London (England).
K. Y. Singh, and L. Draper.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 2, p 9-18, 1969. 5 fig, 5 ref.

Descriptors: *Waves(Water), *Harbors, Forecasting, *Measuring instruments, Fetch, Coasts, Winds.
Identifiers: *Libya(Benghazi Harbour), *Recording instruments.

Details are given of the wave studies associated with the reconstruction of Benhazi Harbour, from the early forecasts, the installation of a recording instrument, its failures and repairs, to forecasts based on more recent techniques and subsequent analysis and presentation of results of records taken from 1961 to 1965. Although reasonable agreement has been obtained between the waves forecast using the latest techniques and the actual measured records, considerable improvement is needed in both the forecasting and recording techniques. Forecasting would be more accurate if wind speed and its duration over the fetch could be determined with greater accuracy. (Sinha-OEIS)
W74-04608

A STUDY ON MASS TRANSPORT IN BOUNDARY LAYERS IN STANDING WAVES,
Kyota Univ. (Japan). Disasters Prevention Research Inst.
For primary bibliographic entry see Field 2J.
W74-04615

APPLICATION OF FLUORESCENT COATED SAND IN LITTORAL DRIFT AND INLET STUDIES,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
M. Stuiver, and J. A. Purpura.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 2, Chap 19, p 307-321, 1969. 8 fig, 2 tab.

Descriptors: *Florida, *Littoral drift, *Sediment transport, Coastal structures, *Estuaries, *Inlets(Waterways), Tracers, Beaches, Coastal engineering, Fluorescent dye.
Identifiers: *Sand bypassing, West Palm Beach(FL).

Fluorescent coated sand is used in tracing the sand movement along beaches and around inlets. As a part of an extensive beach erosion study along the shore of West Palm Beach, Florida, four areas were subjected to such a tracer study. Each area

represented a particular beach configuration either with or without erosion protective structures. The results of a study of the sand migration in and around South Lake Worth Inlet are discussed. It can be concluded that most of the bypassed material originated from the bar region and not from the beach. This means that sediment not only is transported along the bar but also in substantial quanities across the bar. Observations made in the inlet channel show that the sediment carried into the inlet is predominantly a suspended load. Of more significance is the observed transport through the inlet from sediment originating from the south side of the inlet for waves approaching from a northeasterly direction. The negligible amount of sediment transported outward to the ocean makes this inlet an extreme of a sand drain causing a considerable loss of sand from the surrounding beaches as evidenced by these tracer studies. (Sinha - OEIS)
W74-04616

FIELD INVESTIGATION PRACTICES OF COASTAL STUDIES IN JAPAN,
Tokyo Univ. (Japan).
M. Hom-ma.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 2, Part 4, Chap 76, p 1213-1221, 1969. 4 fig.

Descriptors: *Bibliographies, *Coasts, *Coastal engineering.
Identifiers: *Japan.

A brief review is presented of publications on field studies carried out in Japanese coasts. Japan has many projects of coastal works in relation to the development of an industrial area, the protection of coastal land from disaster and some other purposes. Before the execution of these projects, the agencies in charge of them make field investigations. The results of investigations are reported in their official publications and sometimes the abstracts of them are reported at the annual meeting of coastal engineering held by the Japan Society of Civil Engineers. As the official publication of the governmental organizations are distributed in strictly limited circles, they are not well known by scientists and engineers outside these organizations. Some of these official reports and some additional reports were selected from the proceedings of annual meetings of coastal engineering, and a classification of the contents and a brief review of them are presented. (Sinha-OEIS)
W74-04625

THE ATLANTIC COAST OF LONG ISLAND,
Army Engineer District, New York.
For primary bibliographic entry see Field 8A.
W74-04626

CONSTITUENT TRANSPORT IN ESTUARIES,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
B. Glenne.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 2, Part 4, Chap 86, p 1350-1356, 1969. 2 fig, 4 ref.

Descriptors: *Esturaries, *Sediment transport, Diffusion, Mixing, *Bays, *California.
Identifiers: *San Francisco Bay(CA).

During the last two decades considerable progress has been made in analyzing the diffusion process in estuaries. Unfortunately, certain difficulties (e.g. prediction of diffusion coefficients) still prevent common application of the diffusion method. An old technique, related to the diffusion concept, can however, frequently give useful information regarding constituent mixing and transport velocities in natural estuaries. The linear characteristic of the one-dimensional mass continuity equation for constituents (conservative or first order decay) in estuaries shows that the constituent residence times or transport velocities are independent of the consitituent source strength. This fact permits computation of representative constituent transport velocities using artificial or natural tracers with typical discharge locations. The evaluation procedure required a minimum of data and labor; e.g. no knowledge of diffusion coefficients. In estuaries and bays with predominantly one-dimensional constituent transport the procedure gives practical information regarding the mixing and exchange mechanism. In Northern and Southern San Francisco Bay dissolved silica (Si02) was found to be a good representative tracer naturally discharged by rivers and streams. (Sinha-OEIS)
W74-04627

HYDRAULIC MODEL EXPERIMENT ON THE DUFFUSION DUE TO THE COASTAL CURRENT,
Kyoto Univ. (Japan). Disaster; Prevention Research Inst.
For primary bibliographic entry see Field 5B.
W74-04628

SHEAR VELOCITY IN A TIDAL ESTUARY,
Liverpool Univ. (England). Dept. of Civil Engineering.
A. R. Halliwell, and B. A. O'Connor.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 2, Part 4, Chap 88, p 1377-1396, 1969. 4 fig, 12 ref.

Descriptors: *Estuaries, *Tidal effects, *Shear stress, Density.
Identifiers: Mersey River, England, *Shear velocity, Low slack water, Surface slopes, *Energy slope, Inertia, *Tidal cycle, Kinetic energy.

A study involving the determination of the bed shear stress and thence shear velocity in the Narrows of the River Mersey (a well mixed tidal estuary) is described. The two dimensional equation of motion is examined. In order to determine the energy slope, it is essential to evaluate density, inertia and kinetic energy terms as well as surface slopes. Although the density term is much smaller than the other terms it is important at periods of low slack-water. Measurements of the various terms are described and attention is drawn to the difficulties arising in the case of the surface slopes. Comparison is then made between the values of the shear velocity as predicted from the energy slope and those obtained using velocity traverses throughout the depth and with measurements of velocity at three fixed positions near to the bed. Finally consideration is given to the relationship between the cross-sectional mean velocity, the depth-mean velocity at 3 ft above the bed and the shear velocity obtained from the energy slope. There is good linear correlation of each of these velocities with the shear velocity throughout the tidal cycle except for the period around low slack-water. (Sinha-OEIS)
W74-04629

BUOYANCY SPREAD OF WASTE WATER IN COASTAL REGIONS,
Vattenbyggnadsbyran Ltd., Stockholm (Sweden).
For primary bibliographic entry see Field 5B.
W74-04630

USE OF A COMPUTATIONAL MODEL FOR TWO-DIMENSIONAL TIDAL FLOW,
RAND Corp., Santa Monica, Calif.
J. J. Leendertse.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 2, Part 4, Chap 90, p 1403-1420, 1969. 8 fig, 3 ref.

Descriptors: *Hydraulic models, *Shallow water, *Tidal effects, *Estuaries, Coasts, *Currents(Water), *Wave propagation, Equations.
Identifiers: Tidal flow, Bottom friction, Differential equations, Numerical integration.

A new approach is given to the solution of two-dimensional tidal flow in shallow water. It has been shown that the propagation of long waves in coastal waters can be studied successfully by use of a numerical integration method. The multioperation method developed is characteristic of implicit methods; namely, there is no upper limit on the time step for stability reasons, as is the case with explicit methods. The multi-operation method allows a direct and rapid solution of all velocities and water levels on each time level. The multioperational method described is particularly suitable for long-wave computation in coastal waters, where water movements are introduced by changes in the water level (or currents) along the sides of the model and where the effect of bottom friction is larger than the effects of lateral eddy viscosity, which is neglected. The contribution of the convective-inertia terms in the equation of motion is assumed to be small compared to that of other terms. These terms are represented with a lower order of accuracy. The detailed description of computational procedures permits an expedient introduction of geographic features such as water depth, boundaries, and characteristics of bottom roughness for the modeling of wave propagation. (Sinha-OEIS)
W74-04631

FEEDING OF JUVENILE CARP CYPRINUS CARPIO L. IN THE ARAKUM BODIES OF WATER (DELTA OF THE TEREK RIVER) AT EARLY DEVELOPMENTAL STAGES, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Makhachkala (USSR).
K. A. Adzhimuradov.
Vopr Ikhtiol. Vol 12, No 6, p 1079-1972.
Identifiers: *Carp feeding, *Chironomidae, *Cladocera, *Copepoda, Cyprinus-carpio, Deltas, Insects, Juveniles, Mosquitoes, Ostracoda, Rivers, Rotifers, *USSR(Terek River delta), *Growth stages, Fish diets.

Juvenile carp change to exogenous feeding at the first larval state of development, while still having remains of the yolk sac. At this stage it consumes small organisms (rotifers and nauplius stages of Copepoda). At the second and third larval stages of development the main food objects are the copepodid stages of Copepoda, Cladocera, and rotifers. At subsequent larval stages Copepoda predominated over other groups of food organisms, which corresponded to their content in plankton. At the first fry stage the carp changes to feeding at the bottom, detritus appears in his food, and the number of benthic organisms increases (larvae of Chironomidae, Ostracoda, and larvae of mosquitoes and other insects).--Copyright 1973, Biological Abstracts, Inc.
W74-04649

THE APPLICATION OF NUMERICAL SIMULATION MODELS IN THE ASSESSMENT OF THE EFFECT OF DISCHARGES INTO COASTAL WATERS,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 5B.
W74-04674

FEASIBILITY STUDY FOR A SURGE-ACTION MODEL OF MONTEREY HARBOR, CALIFORNIA,
Science Engineering Associates, Inc., San Marino, Calif.
B. W. Wilson, J. A. Hendrickson, and R. E. Kilmer.
Available from NTIS as AD-684 953 for $6.00 paper copy, $1.45 microfiche. Prepared for Army Engineer Waterways Experiment Station. Contract Report No 2-136, October 1965. 206 p, 74 fig, 11 tab, 45 ref. DA-22-079-CIVENG-65-10.

Descriptors: *California, Model studies, *Harbors, *Waves(Water), *Bays, *Coasts, Numerical analysis, Refraction(Water waves), *Surges, Cyclones, *Climate, Winds.
Identifiers: Monterey(CA), Sea and swell, Oscillations, Monterey Canyon, Long period waves, Talweg, Standing waves, Surf-beats, Wave propagation.

The feasibility is shown of reproducing in an engineering model the surge phenomenon that at various times occurs in Monterey Harbor, California. Wind and wave climate prevailing in and near Monterey Bay is described. Sea and swell data summarized for the deep-water vicinity-area and for Monterey Bay itself. Monterey Harbor tends to be quite well protected from the longer period swells. Statistical data for the occurrence of long-period waves at three sensor positions are examined and compared with similar-type data for Santa Cruz Harbor and for Half Moon Bay Harbor. The oscillating characteristics of Monterey Bay are examined. A detailed study is made of the manner of propagation of long period waves into Monterey Bay. Attention is given to the question whether the surge phenomenon in Monterey Harbor is the consequence of surf-beats or of genuine long-period waves. (Sinha-OEIS)
W74-04721

REPRODUCTION OF ESTUARINE STRUCTURE AND CURRENT OBSERVATION TECHNIQUES IN THE HECATE MODEL,
Fisheries Research Board of Canada, Namaimo (British Colombia). Pacific Oceanographic Group.
W. H. Bell.
Manuscript Report Series (Oceanographic and Limnological) No 158, October 18, 1963. 24 p, 13 fig, 1 tab, 10 ref.

Descriptors: *Model studies, *Estuaries, *Currents(Water), *Mixing, *Internal waves.
Identifiers: *Canada(Queen Charlotte Sound), Flushing, Subsurface currents, Halocline, *Hecate model.

The Hecate Model is a physical analogue of the Dixon Entrance - Hecate Strait - Queen Charlotte Sound region. Preliminary experiments established a realistic structure in the model with which true oceanographic experiments can be performed. Methods of making current measurements were demonstrated. In the estuarine system the following were considered: water structure and transport, flushing, the two-layer system, mixing, the halocline, and internal waves. Current observations are concerned with both surface and subsurface currents. (Sinha-OEIS)
W74-04724

SEDIMENTATION IN HAWKE BAY,
Department of Scientific and Industrial Research, Wellington (New Zealand). Oceanographic Inst.
H. M. Pantin.
New Zealand Department of Scientific and Industrial Research Bulletin 171, New Zealand Oceanographic Institute Memoir No 28, 1966. 70 p, 14 fig, 11 tab, 23 ref, 4 plates, 1 map.

Descriptors: *Sedimentation, *Bathymetry, Coasts, *Sediments.
Identifiers: *New Zealand(Hawke Bay), Authigenic minerals, Glauconite, Sedimentary structures, Limonite.

Hawke Bay is a conspicuous re-entrant on the east coast of the North Island, New Zealand, measuring some 50 miles from north-east to south-west and extending about 25 miles inwards from the general line of the coast. The surface sediments in Hawke Bay are divided into five groups; offshore gravel zones, sand belt, mud belt, central zone, and sediments associated with the Lachlan Ridge. The sand belt separates the mud belt from the shoreline and the distribution of these two zones appears to be governed by present-day sedimentation. The central zone and parts of the Lachlan Ridge are at present non-sedimentation areas. Other parts of the Lachlan Ridge are areas of slow sedimentation. Yellowish pumice infillings, which occur in the central zone and on parts of the Lachlan Ridge, apparently owe their color to primary authigenic limonite. Secondary authigenic limonite, formed by the oxidation of glauconite, is found in the same areas as the latter mineral. (Sinha-OEIS)
W74-04726

SELECTED BIBLIOGRAPHY ON BEACH FEATURES AND RELATED NEARSHORE PROCESSES.
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2J.
W74-04728

INSHORE SEA SURFACE TEMPERATURE AND SALINITY CONDITIONS AT AGATE BEACH, YAQUINA BAY AND WHALE COVE, OREGON, IN 1970,
Oregon State Univ., Corvallis. Dept. of Oceanography.
J. J. Gonor, A. B. Thum, and D. W. Elvin.
Available from NTIS as AD-717 068 for $3.00 paper copy, $1.45 microfiche. Data Report No. 45, Reference 70-44, November 1970. 30 p, 5 fig, 5 tab. ONR-N00014-67-A-0369-0001.

Descriptors: *Surf, *Oregon, *Salinity, *Temperature, Topography, Hydrography, Bays, Estuaries.
Identifiers: Agate Beach(OR), Yaquina Bay(OR), Whale Cove(OR).

Daily temperature and salinity conditions measured in the surf at Agate Beach, Oregon, are given and summarized by 15 day periods, with the range, mean and standard deviation of each period indicated. Conditions in 1970 are briefly compared to those observed in 1968 and 1969. Water and near surface air temperatures at a station 3 miles inside Yaquina Bay measured at the daily four tidal extremes are tabulated. A system for continuously recording temperature from a thermistor chain installed in the intertidal is described. The design and construction of thermistor pressure cases, thermistor shielding, and dual range Wheatstone Bridge are described. Data recorded from intertidal thermistor chain installed at Whale Cove, Oregon, at the four daily tidal extremes are given. These data are compared to those from Agate Beach, 10 miles away, and it is concluded that there is poor correlation between the two locations due to hydrographic and topographic differences. (Sinha-OEIS)
W74-04730

AN ANNOTATED BIBLIOGRAPHY OF FLUSHING AND DISPERSION IN TIDAL WATERS,
Navy Hydrographic Office, Washington, D. C.
L. J. Fisher.
Special Publication, H.O. SP-33, January 1960. 34 p.

Descriptors: Coasts, *Dispersion, Mixing, *Circulation, *Tides, *Currents(Water), *Estuaries, *Bibliographies, Salinity, Oceanography, Hydraulics.
Identifiers: Nearshore processes, Flushing.

This bibliography of 126 abstracts represents a survey of the scientific literature in the fields of hydraulics, hydrology, and oceanography. The references are annotated for their application to flushing and dispersion in estuaries and the nearshore environment. The value of this bibliography is in its selection of papers of considerable importance to understanding of all coastal and nearshore processes. (Sinha-OEIS)
W74-04731

RESEARCH IN THE COASTAL AND OCEANIC ENVIRONMENT. A SUMMARY OF RESEARCH ACCOMPLISHED UNDER PROJECT THEMIS,
Delaware Univ., Newark.
W. S. Gaither.
Available from NTIS as AD-714 853 for $3.00 paper copy, $1.45 microfiche. Annual Status Report No CMS-3MD028, October 1970. 32 p, 14 fig, 3 ref.

Descriptors: *Beaches, *Waves(Water), *Coasts, Marine geology, Remote sensing, *Sediment transport, Meteorology, *Currents(Water), *Shallow water.

Progress during the first year of a multidisciplinary study of the coastal environment of a section of the Atlantic Sea Coast (Delaware and adjacent New Jersey and Maryland areas) is summarized. Included are field, laboratory, and theoretical investigations of sedimentary processes, coastal vegetation, tidal marsh soils, wave action and attenuation, air-sea interactions, geological history and marine biology. Correlation of ground observations with high altitude photographic imagery to provide a useful method for the remote characterization of such coastal regions is an important objective. (Sinha-OEIS)
W74-04732

NEW DIMENSIONS IN ESTUARY CLASSIFICATION,
Washington Univ., Seattle. Dept. of Oceanography.
D. V. Hansen, and M. Rattray, Jr.
Limnology and Oceanology, Vol 11, No 3, p 319-326, July 1966. 4 fig, 15 ref.

Descriptors: *Estuaries, *Circulation, *Stratification, *Salt balance, *Salinity, Classification, Tides, River flow, Geomorphology, Coasts.
Identifiers: Tidal currents.

Results of recent theoretical studies are used as a basis for a new two-parameter system of estuarine classification. The classes are delineated by the magnitudes of the relative stratification and circulation parameters associated with changes in the salt balance mechanism. The theoretical results depend on a knowledge of the eddy coefficients of viscosity and diffusivity. Tentative relationships between these coefficients and the bulk parameters of tidal current, river flow, and geomorphology, which are obtained from experimental data, may be used to determine the salinity and net current distributions in partially mixed and well-mixed coastal plain estuaries. (Sinha-OEIS)
W74-04735

AN APPROXIMATION OF THE WAVE RUN-UP FREQUENCY DISTRIBUTION,
Corps of Engineers, Washington, D.C. Beach Erosion Board.
T. Saville, Jr.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 1, Chap 4, p 48-59, 1963. 5 fig, 1 tab, 6 ref.

Descriptors: *Waves(Water), *Frequency analysis.
Identifiers: *Wave run-up, Wave steepness, Overtopping.

The distribution of wave steepness for fully developed sea is obtained from Bretschneider's joint distribution of wave height and wave period. This steepness distribution is used with standard wave run-up curves to develop a frequency curve of wave run-up. Use of this run-up distribution curve will permit more accurate estimation of the variability in wave run-up for design cases, and particularly the percent of time in which run-ups will exceed that predicted for the significant wave. The distribution may also be used with normal overtopping procedures to determine more accurate estimates of overtopping quantities. (Sinha-OEIS)
W74-04740

TRANSFORMATION, BREAKING AND RUN-UP OF A LONG WAVE OF FINITE HEIGHT,
Hokkaido Univ., Sapporo (Japan). Dept. of Engineering Science.
T. Kishi.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 1, Chap 5, p 60-76, 1963. 11 fig, 5 ref.

Descriptors: *Waves(Water), *Beaches, Profiles, Slopes, Shallow water.
Identifiers: *Long waves, Wave transformation, *Breaking waves, *Wave run-up, Shoaling.

In studying the transformation, breaking and run-up of a relatively steep wave of a short period, the theory for waves of permanent type has given many fruitful results. However, the theory gradually loses its applicability as a wave becomes flat, since considerable deformation of the wave profile is inevitable in its propagation. A discussion concerning the transformation of a long wave in a channel of variable section is presented based on the non-linear shallow water theory. Further, some brief consideration is given to the effects of bottom friction on wave transformation. Breaking of a long wave is discussed. Breaking on a uniformly sloping beach and on a beach of parabolic profile is considered and the effects of beach profile on breaking are clarified. Experimental results on wave run-up over a 1/30 slope are described. (Sinha - OEIS)
W74-04741

ON NON-SATURATED BREAKERS AND THE WAVE RUN-UP,
National Engineering Science Co., Washington, D.C.
B. Le Mehaute.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 1, Chap 6, p 77-92, 1963. 4 fig, 7 ref.

Descriptors: *Gravity waves, *Beaches, *Waves(Water), Energy, Slopes.
Identifiers: *Breaking waves, *Wave run-up, Path curvature.

Some theoretical results pertaining to the physical behavior of gravity waves on a sloped plane are presented. The notion of 'saturated' breakers and 'non-saturated' breakers which follow the breaking index curve is introduced. Criteria for different kinds of breaking and successive breaking of waves are presented. Some considerations on the wave run-up are deduced. Then a critical analysis of the method of characteristics is presented, with some possible refinements. Path curvature effect is taken into account and the problem of waves climbing on a dry bed is solved. Criteria for determining saturated and non-saturated breakers and the wave run-up by the method of characteristics are proposed. (Sinha - OEIS)
W74-04742

EFFECT OF ENTRANCE ON SEICHE MOTION IN OCEAN PORTS,
Indian Inst. of Tech., Kharagpur. Dept. of Civil Engineering.
N. Roy.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 1, Chap 7, p 93-113, 1963. 3 fig, 2 tab, 11 ref.

Descriptors: *Waves(Water), *Seiches, *Harbors, Coasts, Model studies, *Ports, Resonnance.
Identifiers: Standing waves.

The seiche motion induced in a partially open harbor is uniquely determined by the standing wave pattern formed in the outside ocean. The variable location and size of the coupling makes the problem essentially three-dimensional. Existing potential theory has been extended, for the case of a simple rectangular port, to simulate ocean conditions by approximating the open ocean by another rectangular basin of large size. The theoretical problem then reduces to solving the Neuman problem for the two-dimensional Helmholtz equation for a polygonal contour. The finite dimensional approximation of an infinite domain is, however, unsatisfactory at least from the analytical point of view. This difficulty has been removed by using elliptic-cylindrical co-ordinates for the semi-infinite domain in which the perturbation potential has been expanded in terms of periodic Mathieu functions. These theoretical developments have been verified by a series of numerical calculations and experimental studies. (Sinha - OEIS)
W74-04743

INVESTIGATION OF SEICHE ACTIVITY IN WEST COAST HARBORS,
Texas Univ., Austin. Defense Research Lab.
G. E. Ellis, and J. L. Collins.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 1, Chap 8, p 114-126, 1963. 8 fig, 3 tab, 14 ref.

Descriptors: *Seiches, *Harbors, Instruments, *Waves(Water), *California.
Identifiers: San Diego Bay(CA), Long Beach Harbor(CA), *Power spectra, Solion infrasonic hydrophone, *Bottom pressure.

The seiche activity in several West Coast harbors has been investigated. This investigation has been oriented mainly as an experimental problem in which a new oceanographic instrument, the solion infrasonic hydrophone is used to detect bottom pressure fluctuations over a range of 5 sec to 1800 sec periods. A limited theoretical consideration of this problem is presented in an attempt to correlate the seiche phenomenon to the harbor geometry. The data presented are for San Diego Bay and Long Beach Harbor. These data were recorded on magnetic tape and returned to the laboratory for analysis. This analysis consists of prewhitening the data with bandpass filters and then computing the power spectra by the method of Blackman and Tukey. A short discussion is presented to relate the use of this type of data to the study of two harbor engineering problems, ship mooring and close quarter navigation. (Sinha - OEIS)
W74-04744

THE ANALYSIS OF HARBOR AND ESTUARY SYSTEMS,
California Univ., Berkeley. Coll. of Engineering.
J. A. Harder.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 1, Chap 9, p 127-135, 1963. 5 fig, 9 ref.

Descriptors: *Estuaries, *Harbors, *Mathematical models, *Analog models, Hydraulic models.
Identifiers: Geometry.

Harbor and estuary systems are usually associated with complex geometry, and thus we ordinarily cannot depend on mathematics to give general solutions. Instead of solving the hydraulic equations of flow in the complex geometry, the geometry is reconstructed of the prototype in a reduced scale, by means of models, and by assuming that the equations governing the full-size and reduced-scale systems are the same, to find specific solutions through direct measurements in the latter. (Sinha - OEIS)
W74-04745

FLUME EXPERIMENTS ON SAND TRANSPORT BY WAVES AND CURRENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
D. L. Inman, and A. J. Bowen.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 2, Chap 11, p 137-150, 1963. 9 fig, 3 tab, 9 ref.

Descriptors: *Sediment transport, *Waves(Water), *Currents(Water), *Shallow water, Coasts, *Beaches.
Identifiers: Nearshore processes, Wave height.

Measurements were made of the sand transport (solid discharge) caused by waves and currents traveling over a horizontal sand bed in water 50 cm deep. The waves had heights of 15 cm, and periods of 1.4 and 2.0 sec. The sand transport was measured first in the presence of waves only, then in the presence of waves superimposed on currents. The currents flowed in the direction of wave travel, with steady uniform velocities of 2, 4, and 6 cm/sec. Since sand moves to and fro under the influence of waves, sand traps were placed flush with the surface at either end of the bed. The net sand transport was determined by subtracting the amount of sand trapped at the downwave end. The total amount of sand caught in both traps was greatest with waves of 2.0 sec period, while the net sand transport was greatest with waves of 1.4 sec period. Super position of waves on currents of 2 cm/sec produced a two-fold increase in the sand transport for both wave types. Surprisingly, faster currents of 4 and 6 cm/sec caused the discharge to decrease somewhat. Estimates of the power expended by waves was obtained from the decrement in wave height as the wave traveled over the sand bed. Certain calculations show that about one tenth of the total power expended by the waves was used in transporting sediment. (Sinha - OEIS)
W74-04746

SUSPENDED SEDIMENT DUE TO WAVE ACTION,
Tokyo Univ., (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W74-04747

LABORATORY STUDY OF SCALE EFFECTS IN TWO-DIMENSIONAL BEACH PROCESSES,
Kyoto Univ., (Japan). Disaster Prevention Research Inst.
Y. Iwagaki.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 2, Chap 14, p 194-210, 1963. 14 fig, 1 tab, 18 ref.

Descriptors: *Beaches, *Waves(Water), *Particle size, *Sand bars, Profiles, *Shallow water, Coasts.
Identifiers: Scale effects, *Wave steepness, *Wave height, Breaking waves.

Laboratory tests on two-dimensional beach processes indicate that these procedures are influenced by the deep-water wave steepness, scale of waves and sand size. The influence of sand sizes on the beach process is not remarkable when the deep-water wave steepness is smaller than approximately 0.01 and, in addition, the ratio of the

wave height to the sand size is smaller than a certain value for each wave steepness. Equilibrium beach profiles are also influenced not only by the deep-water wave steepness but by the wave height and the sand size. The limitation between the normal beach and the storm beach, which is a criterion for generation of longshore bars, can be expressed by the deep-water wave steepness and the ratio of the wave height and the sand size. The crest inclination angle of breaking waves approaches a certain value for each deep-water wave steepness with the formation of the equilibrium beach profile independently of an initial beach slope. This value of the angle agrees fairly with that of breaking waves on the fixed bed of the critical beach slope based on the limitation between spilling breakers and plunging breakers when the deep-water wave steepness is 0.04. (Sinha - OEIS)
W74-04748

LONGSHORE CURRENTS IN ONE AND MULTI-BAR PROFILES RELATION TO LITTORAL DRIFT,
Florida Univ., Gainesville. Coastal Engineering Lab.
P. Bruun.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 2, Chap 15, p 211-247, 1963. 8 fig, 10 tab, 34 ref.

Descriptors: *Littoral drift, *Waves(Water), *Currents(Water), *Beaches, Slopes, Profiles, *Rip currents, Sand bars.
Identifiers: *Longshore currents, Breaking waves, Bottom friction, Continuity principle, Undertow.

Longshore current theories are discussed. A brief review is presented of wave theories for breaking waves including theoretical, laboratory and field results. The longshore current theory based on the momentum inflow over a uniformly sloping beach and bottom is discussed with special reference to its friction factor. Two new longshore current theories - both based on the continuity principle are described. One of them called the rip current approach assumes that all water thrown in by wave breaking runs out in rip currents and will probably be valid for profiles with well developed bars and waves approaching the shore almost perpendicularly. The other theory considers the fact that water from a wave breaking under an angle with the bar flows in with a certain phase difference in time longshore and this will create a longshore slope of the average water table, therefore also a longshore current. The water may return to sea uniformly as undertow or in rip currents or by a combination of both. This theory is particularly valid for waves breaking under a certain, not too small, angle with the bar. In both cases the momentum in the breaking waves is ignored because field observations show that in a well developed bar profile most of the momentum has disappeared inside the bar after wave breaking. (Sinha - OEIS)
W74-04749

RHYTHMIC PATTERN OF LONGSHORE BARS RELATED TO SEDIMENT CHARACTERISTICS,
Tokyo Univ. (Japan). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W74-04750

LABORATORY APPLICATIONS OF RADIOISOTOPIC TRACERS TO FOLLOW BEACH SEDIMENTS,
Corps of Engineers, Washington, D.C. Beach Erosion Board.
For primary bibliographic entry see Field 2J.
W74-04751

A STUDY OF CRITICAL DEPTH AND MODE OF SAND MOVEMENT USING RADIOACTIVE GLASS SAND,
Ministry of Transportation, Yokosuka (Japan). Port and Harbour Research Inst.
For primary bibliographic entry see Field 2J.
W74-04752

TRACING COASTAL SEDIMENT MOVEMENT BY NATURALLY RADIOACTIVE MINERALS,
California Univ., Berkeley. Coll. of Engineering.
For primary bibliographic entry see Field 2J.
W74-04753

SOME CHARACTERISTICS OF THE DUTCH COAST,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
For primary bibliographic entry see Field 2J.
W74-04754

WAVES AND TIDES NEAR THE SHORE,
H. Jeffreys.
Geophysical Journal of the Royal Astronomical Society, Vol 16, No 3, p 253-257, October 1968. 12 ref.

Descriptors: *Gravity waves, *Shores, *Slopes, *Waves(Water), *Tides, Coasts.
Identifiers: *Bottom friction, Tidal waves, Nearshore, Breaking waves.

A simplified method is used to give an asymptotic approximation to the behavior of a gravity wave approaching a sloping shore. It indicates that the first serious departure from the linear behavior is due to the rise in importance of the term in a/k(2)h(3). The dissipation in ordinary cases appears to be mainly due to breaking and not to bottom friction. The principle is applied to the superposition of tidal waves on ordinary sea waves. It appears that breakers can account for the largeness of tidal friction in the ocean, and a modified boundary condition in tidal theory is proposed. (Sinha - OEIS)
W74-04758

NUMERICAL COMPUTATIONS OF STORM SURGES WITH BOTTOM STRESS,
ESSA Inst. for Oceanography, Rockville, Md.
C. P. Jelesnianski.
Monthly Weather Review, Vol 95, No 11, p 740-756, November 1967. 24 fig, 20 ref, 3 append.

Descriptors: Coasts, *Storm surge, Storms, *Waves(Water), Mathematical models, *Forecasting, Weather forecasting, Equations, *New Jersey.
Identifiers: Eddy viscosity, *Bottom slip currents, Wind waves, Tropical storms, Landfalling storms, *Bottom stress, Alantic City(NJ).

The storm surge prediction problem is concerned with the rise of coastal waters brought about by meteorological storms. The rising waters not only inundate coastal areas but also act as a pathway for short surface or wind waves to move and break farther inland. The mechanics and prediction of storm surges are discussed. A linear form of the transport equations of motion is used to compute numerically storm surges generated by model tropical storms traveling across model basins. The storms move in any fixed direction and speed relative to a straight line coast and have a restricted number of physical parameters to fix their strength and size. These parameters are readily available in most weather stations. A dissipating mechanism, introduced by Platzman, using only an eddy viscosity coefficient is modified to include a bottom slip current by means of a bottom slip coefficient. These two coefficients are used to control the amplitude of resurgences on the sea following the passage of tropical storms. Numerical values for the coefficients are empirically determined by comparing computed and observed resurgences off Atlantic City. Nomograms prepared from the computations may help in forecasting future storm surges. (Sinha - OEIS)
W74-04759

APPROXIMATE ESTIMATIONS OF CORRELATION COEFFICIENT BETWEEN WAVE HEIGHT AND PERIOD OF SHALLOW WATER WIND WAVES,
Ministry of Transportation, Yokosuka, (Japan). Port and Harbour Research Inst.
T. Ijima.
In: Proceedings of Eighth Conference on Coastal Engineering Mexico City, November 1962, American Society of Civil Engineers, Part 1, Chap 1, p 1-16, 1963. 5 fig, 6 ref.

Descriptors: *Shallow water, *Waves(Water), *Winds, Energy, *Fetch.
Identifiers: Wind waves, Correlation coefficient, Water depth, Deep water waves.

The equation is derived for the correlation coefficient as a function of fetch on the assumption that the classical energy equation for the significant wave is applicable to the individual wave in a complex sea. Using the same method the correlation coefficient for shallow water waves is estimated as a function of fetch and non-dimensional depth. Also considered is the development of shallow water wind waves and an energy equation for these waves. (Sinha-OEIS)
W74-04761

MODIFICATION OF WAVE SPECTRA ON THE CONTINENTAL SHELF AND IN THE SURF ZONE,
National Engineering Science Co., Washington, D.C.
C. L. Bretschneider.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 1, Chap 2, p 17-33, 1963. 7 fig, 32 ref.

Descriptors: Waves(Water), *Shallow water, *Continental shelf, Continental slope, Coasts, *Percolation, *Refraction(Water waves), Ocean currents.
Identifiers: *Bottom friction, *Wave spectra, Breaking waves, Wind waves, Wave height, Wave period, Surf zone.

The modification of the wave spectrum over the continental shelf is discussed. Modification factors include bottom friction, percolation, refraction, breaking waves, ocean currents, and regeneration of wind waves in shallow water, among other factors. The case for a steep continental shelf with parallel bottom contours and wave crests parallel to the coast and for which bottom friction is neglected was investigated. For this case it is found that the predominant period shifts toward longer periods. The case for a gentle continental shelf with parallel bottom contours and wave crests parallel to the coast and for which bottom friction is important has also been investigated. It is found that the predominant period shifts toward shorter periods as the water depth decreases. The implication is that the significant periods observed in the shallow water over the continental shelf are shorter than those which would be observed beyond the continental slope. In very shallow water, because shoaling becomes important, a secondary peak appears at higher periods. In very shallow water the most probable maximum breaking wave which first occurs would be governed by the breaking depth criteria, whereas in deeper water wave steepness can also be a governing factor. In very shallow water the period of the most probable maximum breaking wave should be longer than the significant period; and for deeper water the period of the most probable maximum breaking wave can be less than the significant period. (Sinha-OEIS)
W74-04762

PHENOMENA AFFECTING IMPROVEMENT OF THE LOWER COLUMBIA ESTUARY AND ENTRANCE,
Corps of Engineers, Portland, Oreg. Special Projects Investigation Section.
J. B. Lockett.
In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 4, Chap 40, p 695-755, 1963. 28 fig, 2 tab, 7 ref.

Descriptors: *Estuaries, *Tidal effects, *Saline water intrusion, *Beach erosion, *Sediment transport, Erosion, Hydraulic models, Reservoirs, *Columbia River, *Littoral drift.
Identifiers: Littoral currents, Shoaling.

Work undertaken to improve the lower Columbia Estuary and Entrance for navigation is described, and past concepts of phenomena controlling the regimen of this area are discussed. Recent advances in technology have given rise to a new concept of tidal hydraulic phenomena which emphasizes the relation of salinity intrusion and littoral movement to the degree of shoaling experienced in estuarine areas. The findings of prototype measurements undertaken in 1959 along the lower Columbia, and other endeavors to expand the knowledge of controlling phenomena, including, statistical wave studies, analyses of offshore changes, studies of attrition and accretion of adjacent shorelines, and comprehensive investigations of the distribution of Columbia River sediments are reviewed in the light of this new concept. Authorization, construction and verification of the comprehensive lower Columbia Estuary hydraulic model are discussed, as well as tests proposed for identification of controlling phenomena and for development of the most effective and economical plan of improvement. Finally, the extent of present knowledge is summarized and considerations are outlined for the future under conditions of controlled upland discharge resulting from contemplated headwater reservoir operation. (Sinha-OEIS)
W74-04763

COASTAL-WATER VEGETATION OF THE LOWER REACHES OF THE DNESTR (IN RUSSIAN),
N. V. Smirnova-Garaeva.
Izv Akad Nauk Mold SSR Ser Biol Khim Nauk. 2. p 18-24, 1972, Illus.
Identifiers: *Coastal vegetation, *Estuaries, Fishing, Navigation, Phragmites-communis, Rivers, Salvinia-natans, Scirpus-lacustris, Stratiotes-aloides, Swamp, Typha-angustifolia, Typha-latifolia, *USSR(Dnestr River), Utricularia-vulgaris, Vallisneria-spiralis, *Vegetation(Coastal), Water.

In order to characterize the vegetation, the lower Dnestr (USSR) was divided into 3 regions: sandy-clayey-steep banked; clayey-floodplain; estuarine-plain. Species growing in each region are enumerated. Vegetation in the swampy territory of the lower Dnestr was classified in 2 groups of plant indicators: plants of the initial stage of swamp formation (e.g., Phragmites communis Trin., Typha angustifolia L., T. latifolia L., Scirpus lacustris L.0 and plants of progressive swamp formation (e.g., Salvinia natans L. All., Utricularia vulgaris L., Vallisneria spiralis L., Stratiotes aloides L.). It is concluded that progressive swamp formation is the rule in the lower Dnestr. It is economically important to preserve navigation on the Dnestr, fishing of its lakes and preservation of the Kuchurganskii estuary. The use of vegetation indicators facilitates development of measures for combatting swamp formation and overgrowth of the Dnestr and its reservoirs by water vegetation.--Copyright 1973, Biological Abstracts, Inc.
W74-04813

PROPAGATION OF A FINITE-AMPLITUDE SURFACE WAVE WITH ALLOWANCE FOR RANDOM IRREGULARITIES OF THE BOTTOM,
Nauchno-Issledovatelskii Radiofizicheskii Institut, Gorkii (USSR).
For primary bibliographic entry see Field 2J.
W74-04841

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

WATER CLEANING TREATMENT,
Raypak Co. Inc., Westlake Village. Calif (Assignee).
H. L. Grimme, Jr.
U.S. Patent No. 3,776,842 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 917, No 1, p 286, December 4, 1973.

Descriptors: *Patents, *Alkaline earth metals, Bacteria, Organic matter, Detergents, *Water treatment, *Membranes, *Demineralization, Separation techniques, Desalination.
Identifiers: *Cellulose acetate membrane, Dissolved minerals.

Clean water is produced by pressure passage of the water through a membrane which rejects or prevents passage of impurities such as dissolved minerals, detergents, organic material, bacteria and other pollutants. The pH of the feed water is reduced to below 7.0 by dividing the feed water stream and contacting a portion of it with a cation exchange media to substitute hydrogen ions for the alkaline earth metals and then recombining the portions of the feed water stream. The feed water is passed under pressure over one side of the cellulose acetate membrane with removal of clean water from the opposite side of it. (Sinha-OEIS)
W74-04710

SOLAR DISTILLATION APPARATUS,
J. Lovrich.
U.S. Patent No. 3,775,257, 3 p, 4 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 916, No 4, p 1481, November 27, 1973.

Descriptors: *Patents, *Solar distillation, *Desalination, Sea water, Fresh water, Equipment, Condensation.

A curved dome formed of sheets of transparent material defines the top closure of a heating chamber. A condensing reflector is placed on the outside of the dome. A continuous gutter is placed along its internal periphery. Radial conveying condenser tubes are connected between a central feed header at the top of the dome and the annular tube along the gutter. A sea water supply tank is positioned at a level above the solar heating chamber. A condenser tank has conveying coils in the fluid receiving condensate from peripheral gutter. The distilland is filtered and fed to an underground reservoir. (Sinha-OEIS)
W74-04720

3B. Water Yield Improvement

WORLD DESERTIFICATION: CAUSE AND EFFECT. A LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
W. C. Sherbrooke, and P. Paylore.
Available from the National Technical Information Service as PB-228 100 $5.50 in paper copy, $1.45 in microfiche. Arid Lands Resource Information Paper No 3, 1973. 168 p, 252 ref. OWRR W-141(3729)(3), 14-31-0001-3729.

Descriptors: *Deserts, *Droughts, *Bibliographies, Semiarid climates, Arid climates, Arid lands, Weather modification, Agroclimatology, Reforestation, Soil stabilization, Water shortage, Grazing, Burning, Land use, Land management, Conservation, Plant populations, Climatology, Irrigation practices, Carrying capacity.
Identifiers: *Climatic change, *Desertification, Nomadism.

An annotated bibliography is presented of 252 references, computer-produced from the University of Arizona's Arid Lands Information System (ALIS), with accompanying text that reviews briefly both cause and effect of world desertification. Causes fall into two categories: long-term (in the geologic sense) climatic change as supported by meteorological, archaeological, geomorphological, vegetational, palynological, and dendrochronological evidence in the literature; and those activities of man's historic occupance of arid and semiarid regions that have contributed to degeneration of marginal lands: agricultural and irrigation practices, grazing, fire, nomadism, and sand stabilization and reforestation. Beyond these two categories, there is a third: climatic fluctuation -- short-term weather patterns induced by uncertain rainfall and followed by cyclic droughts from which marginal areas may not recover if subjected to continued attempts at intensive use that cannot be sustained by a dry year or a succession of dry years. Insufficient water and attempts to increase water supplies to areas endangered by desertification are problems which must be addressed promptly, but training, education, financing, and cultural adaptations will also be required, probably under international sponsorship. (Paylore-Ariz.)
W74-04461

WATER RESOURCES APPLICATIONS,
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 7B.
W74-04584

AVAILABILITY OF GROUND WATER IN THE WINNSBORO AREA, LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 4B.
W74-04596

ELECTRIC CLOUD AND WEATHER MODIFICATION WITH INTENSE RELATIVISTIC ELECTRON BEAMS,
Nevada Univ., Reno. Desert Research Inst.
F. Winterberg.
Nature, Vol 247, No 5439, p 271, February 1, 1974. 2 ref.

Descriptors: *Weather modification, *Artificial precipitation, *Electrical studies, *Cloud physics, Lightning, Electrical coronas.
Identifiers: *Electron beams.

A method of electric cloud and weather modifications is proposed, based on the projection of a rapid sequence of intense relativistic electron beams into the atmosphere. The maximum range in the atmosphere of relativistic electrons is given by the radiation length, about 280 m, which is rapidly approached for electron energies in excess of 50 MeV. A beam of electrons would normally disperse rapidly in the radial direction due to multiple scattering. This however, is not the case for an intense beam of relativistic electrons which is confined by its own magnetic field. Beams up to 1,000,000 A and with electron energies of many million electron volts lasting up to 100 ns have been already produced by the combination of a Marx surge generator with a Blumlein transmission line, connected to a field emission diode. The total beam energies so far achieved reach the value of megajoules. If such a beam is projected into the

atmosphere it will not disperse radially but rather will produce a channel of hot air, with a maximum channel length equal to the radiation length in air. If now repeated beams are projected into this channel after a time lapse which is equal to the time for the air to expand in the channel heated by the first beam, then the following beams will in part propagate through air of reduced density due to the thermal expansion caused by the first beam. For 10 pulses the length would be 2.4 km. The method permits the disposal of a large negative electric charge into a chosen volume of the atmosphere or of a cloud. The local release of electric charges can result in greatly increased electric fields within a certain cloud region leading to enhanced cloud droplet coalescence resulting in increased precipitation. (Knapp-USGS)
W74-04604

3C. Use Of Water Of Impaired Quality

APPLICATION OF DYNAMIC PROGRAMMING IN MARKOV CHAINS TO THE EVALUATION OF WATER QUALITY IN IRRIGATION,
Hebrew Univ., Jerusalem (Israel).
D. Yaron, and A. Olian.
American Journal of Agricultural Economics, Vol 55, No 3, p467-471, August 1973. 1 tab, 14 ref.

Descriptors: Water resources development, *Dynamic programming, *Markov processes, *Economics, *Evaluation, *Water quality, *Irrigation, *Saline water, Value, Estimating, Planning, Optimization, Methodology, Mathematical models, Systems analysis, Regional analysis.
Identifiers: *Mediterranean climate, Salt leaching, Yield fundtions.

System dynamics play an important role in situations typical to the Mediterranean climate, where a dry summer is followed by a wet winter with stochastic quantities of rainfall. Presented in an economic analysis of the effect of water quality on crop yield, emphasizing the dynamic aspects of irrigation with saline water over a sequence of years. Distinction is made between three ranges of time and three corresponding models for analysis of the value of water quality in irrigation: 'short run' model (confined to one irrigation season), 'longrun' model, and 'extended long run' model. The long run model, which accounts for the effects of salt accumulation in the soil profile over time (salt accumulation is underground reservoirs would be considered in the extended long run model) is considered and dynamic programming in Markov chains is utilized to derive an optimal irrigation policy. Estimates of the value of water quality in irrigation are derived which rely heavily on assumptions and yield functions. Possible applications in water resource decisions are discussed. The economic significance of the model is on two levels, the micro farm level and the level of regional water resource development. (Bell-Cornell)
W74-04561

3D. Conservation In Domestic and Municipal Use

MANAGEMENT OF STORMWATER RUNOFF IN SUBURBAN ENVIRONMENTS,
Engineering-Science, Inc., Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W74-04302

OPTIMAL OPERATION OF MULTI-RESERVOIR WATER RESOURCES SYSTEMS,
Texas Univ., Austin. Center for Research in Water.
For primary bibliographic entry see Field 4A.
W74-04314

MULTIPURPOSE RESERVOIRS AND URBAN DEVELOPMENT,
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6B.
W74-04319

APPROACHES TO STORMWATER MANAGEMENT,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5A.
W74-04458

STATISTICAL ANALYSIS OF HYDROGRAPH CHARACTERISTICS FOR SMALL URBAN WATERSHEDS,
Tracor, Inc., Austin, Tex.
For primary bibliographic entry see Field 2A.
W74-04459

THE RAJASTHAN CANAL AREA: A SETTLEMENT STRUCTURE,
Delhi Univ., New Delhi (India). School of Planning and Architecture.
For primary bibliographic entry see Field 6D.
W74-04499

SYRACUSE METROPOLITAN AREA COMPREHENSIVE PLAN-WATER AND SEWER PLAN AND SERVICES ALLOCATION PLAN,
Syracuse-Onondaga County Planning Agency, N.Y.
For primary bibliographic entry see Field 5D.
W74-04507

PRATTVILLE, ALABAMA COMMUNITY DEVELOPMENT PLAN, VOL. II: SUMMARY AND ILLUSTRATIONS.
Central Alabama Regional Planning and Development Commission, Montgomery.
For primary bibliographic entry see Field 5D.
W74-04508

SUMMARY REPORT OF METROMEX STUDIES, 1971-1972.
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W74-04509

HOUSING AND PLANNING REFERENCES.
Department of Housing and Urban Development, Washington, D.C.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 - Price $1.75. New Series No. 49. July/August, 1973. 88 p.

Descriptors: *Bibliographies, Information retrieval, *Sewerage, Comprehensive planning, *Water supply, Conservation, Storm drains, Water resources, Shores, Ecology, *Planning, Cities, *Urbanization.
Identifiers: Geographic index, KWIC index, *Housing.

This report consists of 934 Comprehensive Planning (HUD 701) Reports, arranged by Geographic and KWIC indexes. Accession number, title, report date, state, and geographic place name information is given for every entry. Fifty-four entries are included that cover the topics of water supply, conservation, sewer disposal and storm sewers, water resources, ecology and environment, and shorelines . A revised Subject Heading List for 'Housing and Planning References' and an up-dated listing of the HUD Library and Information Division's Publications in Print are also included. (Hoffman-North Carolina)
W74-04511

EVALUATION OF THE USE OF PRICING AS A TOOL FOR CONSERVING WATER,
George Washington Univ., Washington, D.C. Dept. of Management Sciences.
M. H. Chiogioji, and E. N. Chiogioji.
Washington (D.C.) Technical Institute, Water Resources Research Center. WRRC Report No. 2, 1973. 201 p, 11 fig, 46 tab, 211 ref, append.

Descriptors: *Pricing, *Water conservation, *District of Columbia, Water policy, Water consumption, Water supply, Water costs, Evaluation, Water rates, *Municipal water, Maryland, *Water utilization, *Water demand, Management, Virginia.
Identifiers: Washington, D.C.

Historically the economics of water supply has been oriented toward the provision of low cost water to consumers, with very little thought given to pricing principles and policies which could govern the efficient use and development of municipal water resources. Empirical data gathered in the Washington(D.C.)Metropolitan Area show that price increases do have an impact on water consumption. The use of demand management through price policy is proposed as a tool for rationing existing supplies. There is evidence that demand curves for industrial, agricultural, and some domestic uses are significantly price elastic. A two-part rate structure is also proposed to cover the off-peak winter period and the peak summer period. Other means for conserving water use also are suggested. (Palange-Washington D.C. Tech Inst)
W74-04810

3E. Conservation In Industry

COLOR REMOVAL FROM TEXTILE DYE WASTE BY COAGULATION,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-04303

WATER REUSE AND DEPOSITS CONTROL,
Buckman Labs., Inc., Memphis, Tenn.
For primary bibliographic entry see Field 5D.
W74-04520

ECONOMIC POWER FROM GEOTHERMAL HEAT,
For primary bibliographic entry see Field 4B.
W74-04766

3F. Conservation In Agriculture

SOUTHWESTERN GROUNDWATER LAW: A TEXTUAL AND BIBLIOGRAPHIC INTERPRETATION,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 4B.
W74-04460

PAPER MILL SLUDGE DISPOSAL ON SOILS: EFFECTS ON THE YIELD AND MINERAL NUTRITION OF OATS (AVENA SATIVAL.),
Wisconsin Univ., Madison. Coll. of Agricultural and Life Sciences.
For primary bibliographic entry see Field 5E.
W74-04519

PLANT RESPONSES TO WATER STRESS,
California Univ., Davis. Lab. of Plant-Water Relations.
For primary bibliographic entry see Field 2I.
W74-04539

MILL'S WASTE WATER USED FOR SPRAY IRRIGATION.
For primary bibliographic entry see Field 5D.
W74-04543

SOIL CRUSTING RELATED TO SPRINKLER INTENSITY,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
C. D. Busch, E. W. Rochester, and C. L. Jernigan.
Transactions of the ASAE, American Society of Agricultural Engineers, Vol 16, No 4, p 808-809, 1973. 5 fig, 2 tab, 10 ref. OWRR A-025-ALA(1).

Descriptors: Soils, *Sprinkling, *Infiltration, Runoff, Erosion, *Sprinkler irrigation, *Regression analysis, *Soil moisture.
Identifiers: *Crusting(Soils).

Regression analyses were run to correlate crust strength and crust moisture data. In both field and laboratory studies, the quadratic regression equation of penetrometer (crust strength) reading on crust moisture provided the best fit. It appears that crust strengths developed under two different sprinkling intensities persist over three wetting and drying cycles. Lower sprinkler application rates consistently produced a weaker crust. Increasing the number of water application cycles did not show a consistent effect on crust strength. Previous sprinkling may reduce the strength of a crust formed by subsequent rainfall.
W74-04560

ECONOMIC ASPECTS OF GROUND WATER RESOURCES AND REPLACEMENT FLOWS IN SEMIARID AGRICULTURAL AREAS,
New Mexico Univ., Albuquerque.
For primary bibliographic entry see Field 4B.
W74-04563

A SIMULATION MODEL FOR EVALUATING IRRIGATION MANAGEMENT PRACTICES,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
R. V. Morey, and J. R. Gilley.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 5, p 979-983, Sept.-Oct. 1973. 5 fig, 16 ref.

Descriptors: Water resources development, *Irrigation systems, *Evaluation, *Management, *Irrigation practices, *Simulation analysis, Meterorological data, Crops, Transpiration, Humid areas, Operation and maintenance, Mathematical models, Systems analysis, *Minnesota, *Soil moisture.
Identifiers: Soil moisture budget, St. Cloud(Minn.).

Rainfall variability is an important factor in the analysis of the feasibility of irrigation in humid areas. In addition, soil moisture holding characteristics, crop transportation rates, and operating procedures for the proposed irrigation system must be considered in a complete evaluation. Presented is a soil moisture budget model for simulating and evaluating irrigation systems and management practices. A modified procedure for budgeting the soil moisture content, a modified growth measure index for computing system performance, and example comparisons of irrigation management procedures are presented. Results of a calibration-verification technique are included. The model is used to test several irrigation management policies for two soil types and 24 years of weather data for St. Cloud, Minnesota. Results give a good insight into the variability in year-to-year transpiration response under irrigation. They also show the effect of irrigation policies on improvement of the transpiration ratio. Finally, the results should be useful in aiding irrigation operators to make better management decisions concerning irrigation feasibility and scheduling procedures. (Bell-Cornell)
W74-04564

COST-BENEFIT ANALYSIS OF IRRIGATION PROJECTS IN NORTHEASTERN BRAZIL,
Brookings Institution, Washington, D.C.
W. R. Cline.
American Journal of Agricultural Economics, Vol 55, No 4 Part I, p622-627, November 1973. 1 tab, 7 ref.

Descriptors: *Irrigation programs, *Project feasibility, Evaluation, *Linear programming, *Cost-benefit analysis, *Labor, Employment opportunities, Costs, Arid lands, Optimization, Mathematical models, Systems analysis.
Identifiers: *Brazil(Northeast), *Shadow prices, *Crop selection, Crop schemes.

Cost-benefit analysis using empirical estimation of labor's shadow price and linear programming for crop selection is applied to major irrigation projects in Northeastern Brazil. The projects tend to be large government schemes with very high investment costs and correspondingly are capital intensive. Due to their high capital intensity, the projects would contribute very little to labor absorption. Labor costs are evaluated at an empirically estimated shadow price rather than at the legal minimum wage. The shadow price of labor used is the weighted average of estimated marginal value products within farm size and product sector subgroups, with weights proportional to the percentage of labor force in each subgroup. The empirical estimate is based on production functions for Northeastern agricultural sectors previously estimated by the author. Discussed is the selection of crop mix for the irrigation projects, using a linear programming optimization incorporating demand limitations. In conclusion, over half the project area is approved. However, these capital intensive projects should rank below investments with similar rates of return but larger employment effects. These projects do not offer a major solution to rural poverty in the Northeast since they would provide employment for less than 2 percent of the region's rural labor force. (Bell-Cornell)
W74-04565

ALLOCATION OF SCARCE RESOURCES TO AGRICULTURAL RESEARCH: REVIEW OF METHODOLOGY,
North Crolina State Univ., Raleigh. Dept. of Economics.
C. R. Shumay.
American Journal of Agricultural Economics, Vol 55, No 4 Part I, p557-566, November 1973. 4 tab, 21 ref.

Descriptors: *Resource allocation, *Methodology, *Agriculture, *Research, *Management, *Project planning, Model studies, Surveys, Investment, Evaluation, Cost-benefit analysis, Optimization, Systems analysis, Water resources, *Reviews, Publications.
Identifiers: Project selection.

With an increasing stress on research budgets, the need for investigating alternative models for managing research is growing. Already, much work has been invested in technique development. This literature has been surveyed selectively to emphasize the breadth of methodological developments for research project selection and resource allocation. To precede additional research, the current state-of-the-art in resource allocation methodology pertinent to agricultural research management is presented. The focus is on quantitative approaches for improving internal consistency of subjective judgments. The marginal principle is applicable to the selection of an optimal investment in management, and a rudimentary framework for implementing that principle is suggested. Methods of ranking projects using both single and multi-dimensional measures of project benefit are presented. Methods within the latter category include information systems, scoring models, and benefit contribution models. Approaches for optimizing resource allocation are discussed. Among these are: benefit-cost analysis, optimization models specifically for research, simulation, and a network model. A partial comparative evaluation of the selected methods is included with the survey. In the area of methodological development, there is great need for innovative thought and practical experimentation to compare costs and benefits of alternative subjective decision processes. (Bell-Cornell)
W74-04566

APPLICATION OF REGRESSION ANALYSIS TO ESTIMATION OF THE EFFICIENCY OF WATER USE IN IRRIGATION (OPYT PRIMENENIYA REGRESSIONNOGO ANALIZA K OTSENKE EFFEKTIVNOSTI ISPOL'ZOVANIYA VODY PRI OROSHENII),
A. Z. Zakhidov, and M. Z. Ziyakhodzhayev.
Vodnyee Resursy, No 3, p 167-170, 1973. 2 tab.

Descriptors: *Irrigation efficiency, *Irrigation practices, *Water utilization, *Estimating, *Regression analysis, Correlation analysis, Irrigation, Irrigation water, Irrigation systems, Drainage systems, Drainage water, Fertilizers, Crop production, Cotton, Agriculture, Equations.
Identifiers: *USSR(Uzbek SSR).

The importance of water in the irrigation of lands in an arid region is discussed. Relations of cotton yield to runoff of drainage water and to rates of application of irrigation water and mineral fertilizers were established by regression analysis on the basis of agricultural and reclamation data for the Khorezmskaya Oblast in Uzbekistan for 1956-70. Extensive development of a drainage system on saline and salt-affected lands and adoption of efficient agricultural practices will result in a significant increase in cultivated crop yield without a marked increase in the irrigation rate. Desalinzation of lands already irrigated or scheduled for irrigation in the cotton zone of the USSR is a major regional water management problem in the development and increase in efficiency of irrigated agriculture. (Josefson-USGS)
W74-04580

ROLE OF SOIL CONDITIONS IN THE DEVELOPMENT OF MOTHS, (IN RUSSIAN),
Akademiya Nauk Azerbaidzhanskoi SSR, Baku. Institut Zoologii.
S. V. Aliev, and R. M. Akhmedov.
Ekologiya. Vol 3, No 6, p 81-84. 1972.
Identifiers: Agrotis-Exclamationis, Agrotis-Ypsilon, *Cotton, *Grain, *Moths, *Soil types, *USSR(Azerbaidzhan), Caterpillars.

An investigation of grain (unirrigated and irrigated) and cotton fields in 31 regions of Azerbaidzhan, USSR, revealed that caterpillars of Agrotinae, including Agrotis ypsilon and A. exclamationis, are found most often in nature on unirrigated (lowland and piedmont) chestnut, light-chestnut, and chernozem soils and in irrigated fields on friable chestnut and sandy and sandy-loam sierozem soils. There are almost no caterpillars in salinized, clay, calcareous, and meadow soils.--Copyright 1973, Biological Abstracts, Inc.
W74-04640

RELATIONS BETWEEN SOIL WATER POTENTIAL AND DISEASE IN WHEAT SEEDLINGS INFECTED BY PUCCINIA RECONDITA,
Pye Research Center, Stowmarket (England).
M. C. Cowan, and J. C. Zadoks.
Neth J Plant Pathol. Vol 79, No 1, p 1-4. 1973. Illus.
Identifiers: *Puccinia-recondita, *Soil water potential, Spores, *Wheat seedlings, *Uredospore infection, Seedlings(Diseases).

The seedlings were grown in soil of which the initial water potential was -200/Jkg (joules/kg), -500/Jkg, or -800/Jkg. Uredospore production per seedling was retarded when the soil water potential was low, and soil water potential decreased

more rapidly near the roots of diseased seedlings than it did near the roots of uninoculated seedlings.--Copyright 1973, Biological Abstracts, Inc.
W74-04653

WATER WITHDRAWAL BY PLANT ROOTS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
R. A. Feddes, and P. E. Rijtema.
J Hydrol Amst. Vol 17, No 1/2, p 33-59. 1972. Illus.
Identifiers: Brassica-oleracea, Growth stages, *Red cabbage, *Roots, *Water withdrawal(Plants).

Water withdrawal patterns of red cabbage (Brassica oleraces L., cv. 'Rode Herfst') grown on a sticky clay soil are analyzed. An analysis of the transport resistance for liquid flow in the plant as well as an investigation on the geometry factor of the root system for red cabbage is presented. The variation of these factors with depth is described, and root extraction rates at different depths are calculated and compared with data obtained from water balance studies. The plant resistance data are in reasonable agreement with existing literature. Because of a nonhomogeneous and poor root development in the early stages of growth, the geometry data of the initial growing stages differ by a factor of 10 from data found in literature. With root development increasing with depth, geometry data decrease to values also reported for other crops. From calculations it is shown that at increasing drying out of the soil the geometry factor is slightly affected, but the plant resistance increases considerably. The latter resistance, however, decreases when the evaporation flux from the plant increases. This phenomenon is mainly caused by the root distribution in the soil with depth, resulting in a relatively higher water uptake from the top layers, as compared with the deeper layers, when the evaporation flux increases. The results may at least partly explain the apparent non-Darcian behavior of the flux of water through the plants.--Copyright 1973, Biological Abstracts, Inc.
W74-04655

INFLUENCE OF SOIL MOISTURE CONDITIONS ON GROWTH AND DEVELOPMENT OF THE POTATO SOLANUM TUBEROSUM L.,
Technische Universitaet, Hanover (West Germany). Institut fuer Gemuesebau.
H. Krug, and W. Wiese.
Potato Res. Vol 15, No 4, p 354-364. 1972, Illus, (English summary).
Identifiers: Assimilation, Consumption, *Growth stages, *Potato, Productivity, *Soil moisture, Solanum-Tuberosum, Tuber.

The influence of high (80-100% saturation) and low (20-30% saturation) soil moisture during different growth stages on growth and development of the early cultivar 'Barima' was investigated by means of pot experiments under controlled temperature. Constant high soil moisture, as compared with low soil moisture, increased the growth rate of stems, leaf area and tubers. The net assimilation rate was higher and the number of tubers greater but, in contrast to low soil moisture conditions, about 50% of the tubers was resorbed during succeeding periods of growth. Plants flowered earlier and more abundantly and the length of the growing period was shorter. Low soil moisture during the early growth stages only increased productivity of the plants. Highest tuber yields occurred where there had an initial dry period of up to 36 days. Low soil moisture following a period of high soil moisture caused a pronounced reduction in the growth rates of aerial organs followed by shedding of the basal leaves. The growth rate of the tubers was reduced to a lesser extent and resorption of tubers decreased. High soil moisture prior to tuber set increased tuber initiation during the subsequent dry period. Water consumption was doubled at high soil moisture. Soil moisture during the growth of the mother plants influenced the seed value of the tubers. Initial dry periods decreased time to emergence and increased growth in height of the young plants. The influence of changing soil moisture conditions on growth and bulking in the field are discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-04687

A COMPARATIVE STUDY OF THE SIZE AND RECEPTIVITY OF THE STIGMA IN WHEAT, RYE, TRITICALE AND SECALOTRICUM,
Max-Planck-Institut fuer Zuechtungsforschung, Cologne (West Germany).
L. D'souza.
Z Pflanzenzuecht. Vol 68, No 1, p 73-82. 1972, Illus.
Identifiers: Humidity, Moisture, Receptivity, *Rye, *Secalotrium, Seed set, Size, *Stigma, Temperature, *Triticale, *Wheat.

The duration of stigma receptivity was studied under controlled conditions. The receptivity of the stigma has 2 phases. In the first the stigma is very receptive; the decrease in seed set/day is slight. The second phase is marked by a sudden drop in seed set. The duration of both phases is influenced by temperature and moisture, the influence of the former being greater. In wheat at 20C and 60% relative humidity (RH) both phases last 4 days. At 30C and 40% RH the first phase lasts only 2 days, the second 3 days. In rye at 20C and 60% RH the first phase lasts 6 days, the second 5 days; at 30C and 40% RH the 2 phases have a duration of 3 days each. The duration of receptivity in Triticale and Secalotricum is similar to that of rye. There is no significant difference in the size of stigmas of rye, Triticale and Secalotricum. All have significantly lower stigmas than wheat. The importance of these studies for hybrid wheat production is discussed. Wheat is suitable for wind pollination both as pollen donor and receiver but only under favorable conditions. High temperatures and how humidities are detrimental.--Copyright 1973, Biological Abstracts, Inc.
W74-04690

POTENTIAL INTENSITY OF PHOTOSYNTHESIS IN SOME TOMATO AND BEET SPECIES UNDER DIFFERENT SOIL MOISTURE, (IN RUSSIAN),
Akademiya Nauk SSSR, Petrozavodsk. Inst. of Biology.
V. S. Rodionov.
Fiziol Biokhim Kul't Rast. Vol 4, No 6, p 641-644. 1972, Illus, (English summary).
Identifiers: *Beet species, Carbonic-Acid, Crops, Fodder, Moisture, *Photosynthesis, *Soil moisture, *Tomato, Vegetables.

Optimum photosynthesis was observed at soil moisture of 60-80%; below and above this level photosynthesis intensity decreased. Species (varietal) differences in assimilation of carbonic acid during drought were obtained only in fodder beet, sugar beet and leaf beet.--Copyright 1973, Biological Abstract, Inc.
W74-04691

SOLUBLE PHOSPHATE OUTPUT OF AN AGRICULTURAL WATERSHED IN PENNSYLVANIA,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 5B.
W74-04804

A STUDY ON THE ACCURACY OF RUNOFF ANALYSIS FOR PUMPING DRAINAGE IN PADDY FIELD AREA (IN JAPANESE),
Shimane Univ., Matsue (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 4A.
W74-04811

RIDGE-POOL COMPLEX FORMATION OF KHOTKHURSKY BOG MASS (IN RUSSIAN),
Biologo-Geograficheskii Nauchno-Issledovatelskii Institut, Irkutsk (USSR).
I. G. Lyakhova.
Izv Sib Otd Akad Nauk SSSR Ser Biol Med Nauk. 3. p 60-64, 1972, English summary.
Identifiers: *Bog mass, Cattle litter, Manure, Ridge pool, Sphagnum, *USSR(Irkutsk region), *Phytocoenoses.

The character of ridge-pool complex phytocoenoses of Irkutsk region (USSR) is described. The associations are Pineto sibiricae-Sphagneta squarrosi X mixto-Hypneta, Pineto sibiricae-mixto-Sphagneta X Cariceto limosae-mixto-Sphagneta, and Pineto sibiricae-Cladineta X Sphagneta fusci. The comparison of their vegetation, peat deposits, and microrelief indicates the evolution of ridge-pool complex, the reduction of trophic plants and the development of progressive ridge formation. The upper layers of Sphagnum peat may be used for cattle litter while lower layers (fen peat) may be used for manuring.--Copyright 1973, Biological Abstracts, Inc.
W74-04812

UTILIZATION OF NUTRIENTS FROM SOIL AND FERTILIZERS BY PASTURE GRASS AS DEPENDENT ON SOIL MOISTURE (IN RUSSIAN),
For primary bibliographic entry see Field 4A.
W74-04820

EFFECT OF LIGHT INTENSITY ON THE QUALITY AND FEEDING EFFECTIVENESS OF GREEN FODDER, (IN RUSSIAN),
M. A. Babakhanyan, S. T. Akhverdov, O. B. Gasparyan, G. A. Akopyan, and N. A. Khachatryan.
Biol Zh Arm 24(8): 70-77. Illus 1971.
Identifiers: Feeding, *Green fodder, Intensity, *Light intensity, Minerals, Nitrogen, Proteins, Vitamins, *Corn, *Peas.

Corn and peas were studied in an artificial environmental with air temperatures at 18-21C, air moisture 60-80% and light intensity of 1200, 4000, 8500, 16,000 and 32,000 erg/cm sq. sec. Increase in light intensity improved retention of mineral elements and guaranteed high yield of green fodder and retention of protein N, vitamins, etc. Green fodder grown under 8500 ergs/cm sq. sec. intensity increased weight of suckling pigs by 4.5 kg in 70 days as compared to 1.7 kg for fodder grown under 1200 ergs/cm sq sec intensity.--Copyright 1973, Biological Abstracts, Inc.
W74-04821

DROUGHT RESISTANCE OF RADIATION-INDUCED MUTANT VARIETIES AND PARENT FORMS OF COTTON, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Inst. of Experimental Plant Biology.
N. N. Nazirov, and N. T. Tashmatov.
Dokl Akad S-Kh Nauk. 12. p 15-17. 1972.
Identifiers: *Cotton, *Drought resistance, *Mutant varieties, Radiation.

A comparison of radiation-induced cotton mutants with their initial forms showed that radiation does not substantially affect their drought resistance, despite large difference in other characteristics (photoperiodism, boll size, color and properties of the fiber, ect.). If the initial form was very sensitive to a water shortage in the soil or relative resistant to it, the mutant obtained from it also proved to be, respectively, non-resistant or comparatively resistant.--Copyright 1973, Biological Abstracts, Inc.
W74-04822

THE EFFECT OF WATER SPRAYING ON THE REIN-FORCEMENT OF PHYSIOLOGICAL PROCESS IN COTTON PLANTS,
A. I. Efanova.
Dokl Akad Nauk Tadzh SSR. 15-(9): p 57-59. 1972.
Identifiers: *Cotton, *Organic compounds, *Photosynthesis, Physiological processes, *Transpiration, *Spray irrigation.

Four groups of plants were sprayed with 500, 1000, 1500 and 2000 l/ha. Spraying at 1500 l/ha was the most effective; it increased photosynthesis, and the intensity of transpiration and the formation of larger quantities of organic compounds.--Copyright 1973, Biological Abstracts, Inc.
W74-04823

WATER CONSUMPTION AND BIOLOGICAL COEFFICIENT OF FURROW AND SPRINKLER IRRIGATED COTTON, (IN BULGARIAN),
Academy of Agricultural Sciences, Khaskovo (Bulgaria). Complex Experimental Station.
K. Karev.
Rasteniev''d Nauk. 9(4): p 83-92. Illus 1972. (English summary).
Identifiers: Biological coefficient, *Cotton, Gossypium-Hirsutum, *Sprinkler irrigation, *Water utilization, *Irrigation(Furrow).

The mean 24-hr water use of the native variety No. 4521 of Gossypium hirsutum species varied from planting to development of the 3rd true leaf between 9 and 16 cu m/ha, increasing after that its maximum in the subperiod of most intensive growth and development (flowering-fruiting) of 35 to 53 cu m/ha and declining to 9-19 cu m/ha at the end of the crop-growing season. The consumptive use of water of irrigated and fertilizer cotton fluctuated with the meteorological character of the season between 4210 and 4740 cu m/ha and of non-irrigated and unfertilizer cotton from 2730 and 3330 cu m/ha. At the given level of fertilization (N120P180K60 kg/ha) and at an antecedent soil moisture maintained from flowering to fruiting to both soil depths of over 75% field capacity, the mean 24-hr and the total water consumption of furrow and sprinkler irrigated cotton do not differ substantially because of similar net depths of irrigation water applied. The mean 24-hr water use varied in dependence on the depth to which the soil was wetted. It was from 2 to 4 cu m/ha higher from flowering to ripening in plots the soil of which was wetted to 40 cm compared to that of 70 cm. Soil wetting to 40 cm from flowering to fruiting contributed to a better water supply. The biological coefficient R of unirrigated cotton, estimated after A. M. Alpatev, averaged 0.23 and of irrigated cotton varied from 0.32 to 0.36. In the variants with soil wetting to 40 cm in the flowering-ripening subperiod it averaged 0.34 and with wetting to 70 cm, 0.35.--Copyright 1973, Biological Abstracts, Inc.
W74-04824

RESULTS OF TRIALS WITH TOBACCO AND COTTON ROTATIONS UNDER IRRIGATION, (IN BULGARIAN),
Y. Mulkovski, and I. Popivanov.
Rasteniev''d Nauki. 9(5): p 87-105. 1972. (English summary).
Identifiers: Barley, *Cotton, *Irrigation, Maize, Peanuts, Peas, Poppy, *Tobacco, *Crop rotation.

Cotton and tobacco can be grown alternately and in sequence with other crops (lucerne, barley, peanuts, poppy). Tobacco-cotton rotations were most effective when tobacco was followed by soil-protecting crops such as winter forage pea, winter vetch, garden peas). Post-stubble and soil-protecting winter crops have a positive effect on tobacco. The quality of tobacco grown after regular predecessors is always high, after catch crops it approximates that of tobacco grown in monoculture. Tobacco growing in monoculture gives a lower total produce than tobacco grown in some of the experimented rotations with and without catch crops in which it is in sequence with regular predecessor crops. Tobacco growing is most effective in a rotation with cotton as well as in rotations with peanuts, barley, poppy, winter peas and winter vetch, with steady participation of soil-protecting crops following tobacco and silage maize as catch crops following regular predecessors. The total produce in such rotations is from 11 to 67% higher than of tobacco grown in monoculture. Cultivation of tobacco in rotations with other crops is also an important measure against black shank which causes serious damages in the Sandanski Petrich region, USSR.--Copyright 1973, Biological Abstracts, Inc.
W74-04825

EFFECTS OF FLOODING AND DRAINING AND THEIR ALTERNATION ON THE GROWTH AND UPTAKE OF NUTRIENTS BY RICE (ORYZA SATIVA L., INDICA VAR. IR-8),
University of the Panjab, Lahore (Pakistan). Dept. of Botany.
Khalid Hamid Sheikh.
J Exp Bot. 24(78): p 64-75. Illus. 1973.
Identifiers: Chlorosis, Cultivars, *Drainage, *Flooding, Growth rates, Iron, Manganese, Nutrients, Oryza-Sativa-Indica, Phosphorus, *Rice.

Continuous flooding of the soil (flooded treatment) gave best growth of the cultivar IR-8, whereas soil drained for 4 wk and then flooded for 8 (drained and flooded treatment) resulted in poorest growth and chlorotic plants. Plants grown in the continuously drained soil (drained treatment) and those in the soil flooded for 4 wk and then drained for 8 (flooded and drained treatment) showed intermediate growth. There were no differences in the relative water content of plants growing in the various treatments. Analyses of plant tissues showed that a consideration of the relative concentration of Fe, Mn, and P in the shoots is most closely related to the performance of rice under various cultural conditions. An increase in the concentration of Fe in the plant tissues following flooding was correlated with the best growth (flooded treatment) unless it was accompanied by high level of Mn (as in the drained and flooded treatment) which may have proved toxic, e.g., by interference with Fe metabolism as was evidenced by chlorosis. Measurements of oxidation-reduction potentials, O2 diffusion rates, and the concentration of exchangeable and soluble Fe and Mn in the soils showed that the drained and flooded treatment caused the most extreme reducing conditions. Flooding accompanied by the development of extreme reducing conditions led to a greater accumulation of Mn in the shoots (drained and flooded treatment) whereas flooding accompanied by the maintenance of oxidizing conditions (flooded treatment) resulted in a lower uptake of Mn. Growth of rice plants for 4 wk in the drained soil did not fit them for the reduced conditions which developed during subsequent flooding (drained and flooded treatment).--Copyright 1973, Biological Abstracts, Inc.
W74-04826

NUTRIENT UPTAKE BY WINTER WHEAT IN A ZONE OF UNSTABLE MOISTURE, (IN RUSSIAN),
I. M. Shaposhnikova, and L. I. Makarova.
Agrokhimiya. 3. p 51-56. Illus. 1972.
Identifiers: *Nutrients, *Wheat(Winter), *Soil moisture, Moisture zones, Nitrogen, Phosphorus, Potassium.

In black-soils characterized by moisture instability, the accumulation of dry matter, N and P by the plants was prolonged to the ripening phase, and that of K to the ear formation phase. The fertilizers increased the amount of dry matter of plants and the accumulation of N, P and K. The ratio of K:P2O5:K2O in the plants changed depending on the phase of development and nutritional conditions.--Copyright 1973, Biological Abstracts, Inc.
W74-04827

A STUDY ON THE DEPTH OF BASIC TILLAGE AND SOIL FERTILIZATION FOR MAIZE GROWN UNDER IRRIGATION, (IN BULGARIAN),
Academy of Agricultural Sciences, Chirpan (Bulgaria). Inst. of Cotton.
N. Kralev.
Rasteniev''d Nauki. 9(5): p 107-118. Illus. 1972. (English summary).
Identifiers: *Fertilization, *Irrigation, Plowing, Soils, Tillage, *Corn(Field).

The depth of plowing for maize grown in the rotation maize-wheat-maize on leached chernozem-smolnitsa soil was studied. Basic tillage for maize (1st field) was experimented at the depths of 18-20, 28-30, 38-40 cm with soil loosening in addition to 8-10 cm at 3 fertilizer levels, no fertilizing, mineral fertilizing at the level in kg/ha of N160P160 and organic fertilizing at the rate of 20 tons/ha. The depth of plowing for wheat was 10 to 15 cm and for maize in the 3rd year 18 to 20 cm. The results of the 5-yr study showed that with no fertilizers the maize yield increases significantly as a result of tillage to a greater depth. Application of mineral and organic fertilizers, in combination with ploughing to 28-30 and 38-40 cm and with irrigation, raises the grain yield by 510 and 520 kg/ha respectively. Plowing to 25 cm combined with 8 to 10 cm subsoiling has no greater effect upon the yield than plowing to 18-20 cm. The aftereffect of ploughing upon the following wheat crop is slightly mainifested at greater plowing depth. In the 3rd yr after subsoiling an influence was observed in the experimental variants with mineral and organic fertilizing in the instances of ploughing to a greater depth. The effect of fertilizing increased substantially when the basic tillage was done at the depths of 28-30 and 38-40 cm.--Copyright 1973, Biological Abstracts, Inc.
W74-04828

RAINFED RICE IN SOUTHERN SENEGAL: EVALUATION OF THREE YEARS' EXPERIMENTATION (1966-1969), (IN FRENCH),
Centre National de Recherches Agronomiques de Bambey (Senegal).
G. Haddad, and L. Seguy.
Agron Trop Ser Riz Rizic Cult Vivrieres Trop. 27(4): p 419-461. Illus. 1972. (English summary).
Identifiers: Experimentation, Fertilizers, Helminthosporium-Oryzae, Pyricularia-Oryzae, *Rainfed crops, *Rice, Sowing, Tillage, *Africa(Senegal), *Fungus diseases(Crops).

The major causes of poor yields in this area are: too-late sowing dates, insufficiently productive varieties, bad physical properties of the soil, bad tillage methods (most often superficial), the record rainfall in this region and frequent fungus attacks (Piricularia oryzae, Helminthosporium oryzae). By earlier sowing on soils well tilled and fertilized and by the use of varieties (indica dwarf type) resistant to diseases, it is possoble to obtain yields of more than 40 q/ha, with only the risks inherent in all rainfed crops.--Copyright 1973, Biological Abstracts, Inc.
W74-04829

EFFECT OF FERTILIZERS AND IRRIGATION CONDITIONS ON YIELD, CHEMICAL COMPOSITION, BAKING QUALITIES OF WINTER WHEAT GRAIN OF BEZOSTAYA 1 CULTIVAR, (IN RUSSIAN),
Gori Agricultural Inst. (USSR). Dept. of Organic Biological Chemistry.
N. I. Prokopenko.
Biol Nauki. 15(8): p 92-95. 1972.
Identifiers: Chemical composition, Cultivars, *Fertilizers, Gluten, Grain, *Irrigation, Mineral, Nutrition, Protein, *Wheat(Winter), *Crops yield, *USSR(Osetian ASSR-Kirov region).

On the leached chernozem soils of the Kirov region of North Osetian ASSR the maximum yield of this high-quality cultivar (up to 50 cwt/ha) was ob-

tained with irrigation and the application of N120P120K120. In the case of irrigation without fertilizers the grain yield increased much less (6 centners/ha). The total protein and gluten contents in the grain decreased and the baking properties were of low quality. The swelling property of the gluten in acetic acid was maximum when high rates of inorganic fertilizers were applied. Better physical properties of the dough were obtained with the joint application of organic and organic fertilizers.--Copyright 1973, Biological Abstracts, Inc.
W74-04830

COMPARATIVE TESTING OF SHORT-TERM WHEAT MONOCULTURE, (IN BULGARIAN),
Academy of Agriculture Sciences, Karnobat (Bulgaria). Complex Research Inst. of Agriculture.
A. Vassilev.
Rasteniev'd Nauki. 9(4): p 49-58. 1972. (English summary).
Identifiers: Comparative testing, Decomposition, Nitrogen, Nutrition, Organic matter, Root rot, *Wheat monoculture, *Crop rotation, *Corn(Field).

A rotation including one year of maize and 3 yr of wheat was studied in comparison with the ordinary wheat-maize sequence. The former rotation was studied in 2 variants concerning the basic tillage to maize, namely, ordinary plowing to the depth of 25-30 cm and deep plowing to 45-50 cm. Each field (crop) received yearly fertilizers equivalent to 130 kg/ha N and 100 kg/ha P. As a variable of the test one half of each of the 2 wheat fields in the 1st rotation, i.e., the 2nd and 3rd yr of wheat received in addition one half rate of N. Prolonged wheat growing in monoculture under the conditions prevailing in the region and at present applied farming technique results in decreasing yield. This decline in yield is due mainly to poorer N nutrition because of disturbed organic matter decomposition in soil and to heavy inflicted by root rot. The 1st agent affects the wheat crop every year and the second only in years with cool and wet springs. A single plowing to a depth of 45 cm contributes to storing and preserving larger amounts of soil moisture and facilitates organic matter decomposition in the soil. Additional N fertilizing increases the wheat yields reaching in some years those of the ordinary wheat-maize sequence.--Copyright 1973, Biological Abstracts, Inc.
W74-04831

PRODUCTIVITY AND GRAIN QUALITIES OF CERTAIN NEWLY DEVELOPED NATIVE AND FOREIGN WHEAT VARIETIES GROWN UNDER IRRIGATION, (IN BULGARIAN),
Academy of Agricultural Sciences, Tolbukhin (Bulgaria). Inst. of Wheat and Sunflowers.
I. Doncheva, and V. Gotsova.
Rasteniev'd Nauki. 9(4): p 59-68. Illus. 1972. (English summary).
Identifiers: Grain, *Irrigation, *Wheat varieties, *Crop production.

'Bezostaya 1' and 'Erythrospermum 19-16,' 'Kaliakra,' 'Dobrudja,' 'Russalka,' 'No. 54/61-2,' 'No. 142/61-1,' 'No. 55/61-39,' and 'No. 102-4' and the newest high-productive Soviet varieties 'Kavkaz,' 'Avrora' and 'Skorospelka 35' were tested. 'Russalka' variety, under irrigation proved most productive, yielding on a 2-year average 7200 kg/ha against 6090 kg/ha for 'Bezostaya 1.' It has a low, thick and lodging-resistant stem, great earliness, good frost resistance, high grain indices and medium baking qualities. As a variety of intensive type, responding positively to abundant fertilizing and irrigation, it is suited for growing under irrigation. The rest of native varieties and selected lines also possess enhanced productivity and a number of valuable economic properties but they are not satisfactorily lodging-resistant. They may be used as initial parental forms in hybridization while some of them may be grown on farms after a more extensive ecological testing. The new Soviet varieties 'Kavkaz,' 'Avrora' and 'Skorospelka 35' are highly productive, have a high-quality grain and are resistant to diseases but because of insufficient lodging-resistance and late ripeness are not very suitable for growing as irrigated crops.--Copyright 1973, Biological Abstracts, Inc.
W74-04832

NEW CONTRIBUTIONS TO BIOLOGICAL STUDY OF GENETIC TRANSMISSION OF RESISTANCE TO DRYNESS IN DOUBLE HYBRIDS OF ZEA MAYS,
Paris Univ. (France).
D. Buican.
Rev Biol (Lisb). 8(1-4): p 33-56. 1972.
Identifiers: Biological studies, Cell, Double, Dryness, *Genetic transmission, *Hybrids(Corn), Sap, Transpiration, *Corn(Field), *Crops resistance(Dryness), Crops yield.

Two series of double hybrids of Z. mays ('Iowa 4316,' U.S.A. and 'Warwick 303,' Canada) and the parent lines which consisted of 2 simple hybrids and 4 self-fertilized consanguineous lines were tested as to their drought resistance using a variety of methods. Plants were exposed to dryness in the field and in greenhouse pots. Resistance was evaluated according to the relative yields of the exposed and control plants. Also determined were the transpiration coefficient, the accumulation of dry matter and transpiration during the period following exposure, the cell sap concentration, the bound water and resistance to plasmolysis. The physiological indices by themselves did not indicate drought resistance in any of the cases; the degree of resistance could be expressed only by the percentage of values obtained for these indices under dry conditions with respect to those recorded for the same plants under normal conditions. Although heterosis exerts a considerable influence on the productivity and growth of plants, its effect on physiological characteristics such as resistance to dryness is often not discernable. Thus drought resistance cannot be expected to increase from hybridization.--Copyright 1973, Biological Abstracts, Inc.
W74-04833

DROUGHT AND SUPPLEMENTARY FEEDING OF SHEEP IN THE KAROO,
J. G. Cloete.
J S Afr Vet Assoc. 43(3): p 243-250. 1972.
Identifiers: *Africa(Karoo), *Drought, Fodder crops, Lucerne, Maize, Molasses, Nutritional supplements, Phosphorus, *Sheep(Feeding), *Veld management, Water supply.

In a review of methods to carry sheep over seasonal droughts in the Karoo (South Africa) proper veld management, utilization of drought resistant fodder crops and the importance of an adequate water supply are stressed. Carbohydrate lack is the major nutritional deficiency, while phosphorus supplementation seems to be advantageous. During seasonal droughts veld supplementation by a lick containing energy-producing food, phosphate, salt and molasses was not only cheaper than supplementary feeding with, e.g., maize and lucerne, but eliminated pregnancy toxemia and heightened estrous activity. During protracted (periodic) droughts handfeeding must be used, which must be begun when the body mass in the case of dry sheep is reduced to about 85 lb (38.6 kg). The best results were obtained with a ration of maize and lucerne hay in equal parts.--Copyright 1973, Biological Abstracts, Inc.
W74-04834

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

MATHEMATICAL MODELING OF STREAM STORAGE POTENTIAL,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 2E.
W74-04305

SOCIOCULTURAL IMPACT OF RESERVOIRS ON LOCAL GOVERNMENT INSTITUTIONS, ANTHROPOLOGICAL ANALYSIS OF SOCIAL AND CULTURAL BENEFITS AND COSTS FROM STREAM CONTROL MEASURES--PHASE 4,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 6B.
W74-04311

OPTIMAL OPERATION OF MULTI-RESERVOIR WATER RESOURCES SYSTEMS,
Texas Univ., Austin. Center for Research in Water.
W. S. Butcher, and A. Sundar.
Technical Report No CRWR-100, HYD-14-7301, October 1973. 136 p, 27 fig, 26 tab, 59 ref. OWRR B-096-TEX(2). 14-31-0001-3651.

Descriptors: *Management, Water resources development, Urbanization, Systems analysis, *Optimization, Stochastic processes, *Dynamic Programming, *Texas, *Reservoir operation, Multiple-purpose reservoirs, Waste demands, Water supply.
Identifiers: *San Antonio(Tex).

A method is developed for solving the problem of optimal operation of multi-reservoir water resources systems. In the method employed, account is taken not only of the stochastic aspects of the inflows but also those of demands and the possible correlation between inflow and demand sequences, as well as the uncertainties of future demographic and economic factors. The multi-reservoir system is decomposed into interlinked subsystems for which operating policies are developed by separate dynamic programming formulations. An iterative procedure is used to adjust the operating policies of the subsystems until the necessary correspondence between the subsystem policies is reached. Synthetically generated sequences of inter-related inflows and demands are used to gain insight into the variation of system performance caused by the uncertainties in inflows and demands, while the concept of alternative futures is utilized to gauge the effect of changes in demographic and economic factors. The efficacy of the method is demonstrated by applying it to derive the optimal operation of the San Antonio water resources system. (See also W74-04315)
W74-04314

COMPLETE LISTING OF PROGRAM DESCRIBED IN OPTIMAL OPERATION OF MULTI-RESERVOIR WATER RESOURCES SYSTEMS,
Texas Univ., Austin. Center for Research in Water Resources.
W. S. Butcher, and A. Sundar.
Available from National Technical Information Service as PB-227 939 $3.75 in paper copy, $1.45 in microfiche. Supplement to Technical Report HYD-19-7301, CRWR-100, (October 1973), 60 p. OWRR B-096-TEX(3).

Descriptors: *Computer programs, *Dynamic programming, Optimization, *Programming languages.

See W74-04314.
W74-04315

MULTIPURPOSE RESERVOIRS AND URBAN DEVELOPMENT,
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6B.
W74-04319

MATHEMATICAL MODELING FOR STATUS PREDICTION AND CONTROL OF WATER DISTRIBUTION SYSTEMS,
General Electric Co., Philadelphia, Pa.
H. D. Gilman, M. Y. Goodman, R. DeMoyer, and J. V. Radziul.
Available from National Technical Information Service as PB-227 919 $4.00 in paper copy, $1.45 in microfiche. Research Report, (1973). 8 p, 1 fig, 4 ref. OWRR C-3166(3734)(3).

Descriptors: *Water distribution(Applied), *Control systems, *Water districts, *Regression analysis, Model studies, *Computer models, Logging(Recording), Simulation analysis, Head loss, Pumps, Tanks, Flow, Systems analysis, *Pennsylvania, Mathematical models.
Identifiers: Network models, Pumping stations, *Philadelphia(Pa.), Load control center.

This study is concerned with the investigation and development of computer methodologies and software which lead to the eventual 'closed loop control' or computer assisted-supervisory control of water distribution systems. The two approaches to mathematical modeling currently being investigated are the traditional network model and a regression model; both are discussed and compared in detail in the context of water distribution system control. The network model comprises the usual flow-head representations of the system's individual elements--pipes, pumps, and tanks; these elements are defined in the standard manner for a Hardy Cross network balance. The water distribution regression model is a set of quasi-empirical mathematical expressions relating important variables, particularly those associated with control, such as pumping station head or tank level. One of Philadelphia's water distribution districts was used as a test bed for the research. The district--the Torresdale High Service - Fox Chase Booster District--comprises 27 square miles with elevations ranging from 100 to 265 feet and is fed by two pumping stations separated by a distance of five miles, which ride on two different tank fields six miles away. The pumping stations are regulated by a load control center which has data logging and supervisory control capabilities. (Bell-Cornell)
W74-04320

HURRICANE TIDE PREDICTION FOR NEW YORK BAY,
Texas A and M Univ., College Station. Dept. of Oceanography and Meteorology.
For primary bibliographic entry see Field 2L.
W74-04343

PERMAFROST CONSIDERATIONS IN LAND USE PLANNING MANAGEMENT,
Bureau of Land Management, Anchorage, Alaska.
For primary bibliographic entry see Field 2C.
W74-04361

INSTITUTIONAL FRAMEWORK AFFECTING THE USE OF INLAND WETLANDS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
T. R. Gupta, and J. H. Foster.
Available from the National Technical Information Service as PB-228 134 $4.75 in paper copy, $1.45 in microfiche. Publication No 91, Cooperative Extension Service, USDA-University of Massachusetts, Amherst, 1973. 39 p, 4 tab, 16 ref, append. OWRR B-023-MASS(9), 14-31-0001-3596.

Descriptors: *Wetlands, Economics, Institutions, *Institutional constraints, Northeast U.S., *Massachusetts, *Land use, Legislation, Taxes, *Regional economics, Cities, Planning, Preservation, Leases, Bond issues, Market value, Land management.
Identifiers: *Ownership costs.

The relationship between wetlands and man, as conditioned primarily by the institutional considerations, is discussed. Emphasis is on the description of forces affecting wetland usage and the social value of such lands. Forces studied include the laws governing wetland usage; nature of ownership; ownership costs such as taxes; and goals and plans of the owners of wetlands. Also considered are the activities of groups such as real estate dealers, and construction firms, and the influence of public opinion. The study is based on the survey of wetlands in fourteen Massachusetts towns and cities. Specific recommendations are made for more comprehensive land use legislation; election and composition of municipal conservation commissions; regional rather than local approach to conservation; wetland protection by delineation of boundaries and planned preservation measures; acquisition of wetlands through installment bonds purchase or public lease programs; and taxation exemption for wetlands based on 100% market value of lands. (Larson-Massachusetts)
W74-04462

THE RAJASTHAN CANAL AREA: A SETTLEMENT STRUCTURE,
Delhi Univ., New Delhi (India). School of Planning and Architecture.
For primary bibliographic entry see Field 6D.
W74-04499

CAPITALIZATION OF THE BENEFITS OF WATER RESOURCE DEVELOPMENT,
Kansas Univ., Lawrence.
For primary bibliographic entry see Field 6B.
W74-04501

LAND VALUE INCREMENTS AS A MEASURE OF THE NET BENEFITS OF URBAN WATER SUPPLY PROJECTS IN DEVELOPING COUNTRIES: THEORY AND MEASUREMENT,
Maxwell Graduate School of Citizenship and Public Affairs, Syracuse, N.Y. Metropolitan and Regional Research Center.
For primary bibliographic entry see Field 6B.
W74-04502

CENTO SEMINAR ON THE APPLICATION OF REMOTE SENSORS IN THE DETERMINATION OF NATURAL RESOURCES.
Central Treaty Organization, Ankara (Turkey).
For primary bibliographic entry see Field 7B.
W74-04567

WATER PROBLEMS OF THE TISZA RIVER IN HUNGARY AND COOPERATION AMONG TISZA BASIN COUNTRIES IN THE FIELD OF WATER MANAGEMENT (VODNYYE PROBLEMY REKI TISY V VENGRII I SOTRUDNICHESTVO STRAN BASSEYNA TISY V OBLASTI VODNOGO KHOZVAYST VA),
I. Degen.
Vodnyye Resursy, No 3, p 3-22, 1973. 12 fig, 4 tab, 3 ref.

Descriptors: *River basins, *Watersheds(Basins), *Watershed management, *Water management(Applied), Flood control, Irrigation operation and maintenance, Reservoir operation, Water resources, Water demand, Water supply, Water utilization, Water quality, Maps.
Identifiers: USSR, *Hungary, *Tisza River.

The Tisza River--the largest left-bank tributary of the Danube--flows through the Soviet Union, Rumania, Czechoslovakia, Hungary, and Yugoslavia. The area of the Tisza drainage basin is 157,000 sq km, and the length of the river is about 1,000 km. Orographically, the river basin is divided into two parts: the mountainous part (absolute elevation--1,800-2,000 m), and the lowland part (elevation--200 m; area--80,000 sq km). Droughts, flood damage, and lack of satisfactory sites for storage reservoirs are typical of the Hungarian part of the Tisza basin and determine the magnitude of the basin's water management problems. To resolve these problems, plans are underway to strengthen levees, improve channel conditions of the Tisza River, and construct new reservoirs in different parts of the basin. Basic characteristics of the water regime of rivers in the Tisza basin and effects of human activity on it are discussed, and expansion of international cooperation among socialist countries in developing the water management of the Tisza basin is urged. (Josefson-USGS)
W74-04574

TOPOLOGY OF RIVER SYSTEMS AND HYDROGRAPHIC INDICATOR STUDIES (TOPOLOGIYA RECHNYKH SISTEM I GIDROGRAFICHESKIYE INDIKATSIONNYYE ISSLEDOVANIYA),
For primary bibliographic entry see Field 2A.
W74-04578

RESERVOIRS OF EUROPE AND SOME ASPECTS OF THEIR CONSTRUCTION AND MULTIPURPOSE USE (VODOKHRANILISHCHA ZARUBEZHNOY YEVROPY I NEKOTORYYE VOPROSY IKH SOZDANIYA I KOMPLEKSNOGO ISPOL'ZOVANIYA),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 8A.
W74-04582

EFFECT OF THE FOREST ON THE DISPLACEMENT OF THE DESNA RIVER BED AND THE SIGNIFICANCE OF THIS EFFECT ON FOREST PLANTING IN THE FLOODPLAIN, (IN RUSSIAN),
L. V. Lesovskaya.
Lesovod Agrolesomelior Resp Mezhved Temat Nauchn Sb. 20. p 120-125, (1970).
Identifiers: Conversion, *Desna River bed, Displacement, *Erosion, Europe, *Floodplains, *Forest planting, Land, Plantation, *River beds.

Regularities were revealed in the influence of the riverrain forests on the development of meanders and the magnitude of the conservation of the floodplain lands. No aging of meanders occurs in the zones of influence of the forest meander. Pecularities of the development of meander systems are singled out according to their position in relation to the afforested area. The results obtained are of a theoretical interest and have a practical significance for establishing the most rational arrangement of riverrain plantations, as well as for calculating the speed of river bed erosion of the Desna River type of floodplain.--Copyright 1973, Biological Abstracts, Inc.
W74-04641

OBSERVATIONS ON THE VEGETATION OF THE KORONOWO RESERVOIR,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.
For primary bibliographic entry see Field 2I.
W74-04654

DEATH OF THE MARSHES IN THE ARDENNES,
C. Dauphin.
Entomologiste. Vol 28, No 4/5, p 104-105. 1972.
Identifiers: Boloria-aquilonaris, *France(Ardennes plateau), Gentiana-pneumonanthe, Lycaena-Helle, *Marshes, Osmunda-regalis, Oxycoccus-palustris, Proclossiana-eunomia, Trientalis-europaea, Vaccinium-uliginosum, Vaccinium-vitis-idaea, *Endangered species, *Commercial development, *Drainage.

The marshes north of Charleville-Mezieres in the French plateau of the Ardennes along the Belgian frontier are being drained to give way to commercial development. The already endangered fauna and flora is progressively disappearing including the rare Lepidoptera Lycaena helle, Proclossiana eunomia, and Boloria aquilonaris and the plant species Oxycoccus palustris, Vaccinium vitis idaea, V. uliginosum, Osmunda regalis, Gentiana pneumonanthe and Trientalis europaea.--Copyright 1973, Biological Abstracts, Inc.
W74-04686

EFFECT OF LONG-TERM APPLICATION OF VARIOUSLY HIGH RATES OF NUTRIENTS ON NATURAL GRASSLAND SWARDS,
O. Tomka, and E. Lihan.
Ved Pr Vysk Ustavu Luk Pasienkov Banskej Bystrici. 8: p 21-31. 1972. Illus. (English summary).
Identifiers: Agropyron-repens, Alopecurus-pratensis, Crop, *Grasslands, *Legumes, Nitrogen, *Nutrients, Phosphorus, Production rates, *Swards.

The nutrient rates were 50-250 kg N/ha in 2 different ratios of N:P:K. When 100 kg N/ha was applied the legumes disappeared from the sward. At 100 kg/ha and above, Alopecurus pratensis increased on valley meadows, in a hill-land region on soils with an unstable water regime. After 8-10 yr, growth of Agropyron repens started on all locations. The production on meadow crops increased up to the highest application rate. With higher rates of P and N the yield increased only slightly.--Copyright 1973, Biological Abstracts, Inc.
W74-04693

PRODUCTION ABILITY OF LEGUMES, GRASSES AND THEIR MIXTURES IN HILL-LAND REGIONS,
J. Kasper.
Ved Pr Vysk Ustavu Luk Pasienkov Banskej Bystrici. 8: p 71-81. 1972. (English summary).
Identifiers: Climates, Dactylis-glomerata, *Grasses, Hill lands, *Legumes, Lotus-corniculatus, Medicago-sativa, Mixtures, Moisture, *Production, Trifolium-pratense, *Nitrogen, *Nutrients.

The productivity of different legume-grass mixtures and monocultures of legumes (Trifolium pratense, Medicago sativa, Lotus corniculatus) and grasses (Dactylis glomerata) was investigated at different levels of N nutrition (0, 20, 50, 100, 150, 200 kg/ha pure nutrients). Legume-grass mixtures provided higher yields of dry matter than the monocultures of legumes. Orchard grass was a strong competing species; itjprevented the encroachment of weeds. Its proportion rose from 10-16% (first utility yr) to 64-76% (sixth utility yr). Cultivation of monoculture grass stands was justified only at an application rate not lower than 200 N. At lower rates the legume-grass mixtures provided a higher production. The production potential was strongly influenced by climatic and moisture conditions. Monoculture grass swards at higher rates of N provided more balanced and secure yields than legume-grass swards rich in legumes.--Copyright 1973, Biological Abstracts, Inc.
W74-04694

POWER LAW DEPENDENCE ON TIME OF RIVER FLOOD DECAY AND ITS RELATIONSHIP TO LONG-TERM DISCHARGE FREQUENCY DISTRIBUTION,
California Univ., Los Angeles. Dept. of Planetary and Space Science.
G. Schubert, and R. E. Lingenfelter.
Water Resources Research, Vol 10, No 1, p 98-102, February 1974. 4 fig, 1 tab, 5 ref. NASA Grant NGL 05-003-404.

Descriptors: *Flood forecasting, *Recession curves, *Flood frequency, Probability, Streamflow forecasting, Hydrograph analysis, Duration curves.

River discharge frequency distributions, based on long-term records of daily streamflow, often have an inverse power law dependence on discharge. This reflects the recession of individual river floods, which have an inverse power law dependence on time with an exponent of l/(s + l), where s is the slope of the power law dependence on discharge of the river discharge frequency distribution. This relationship allows forecasting of river discharges with about 5% uncertainty for as much as 30 days after flood peaks. (Knapp-USGS)
W74-04806

VERIFICATION OF WATER TEMPERATURE FORECASTS FOR DEEP, STRATIFIED RESERVOIRS,
Oregon State Univ., Corvallis. School of Oceanography.
W. V. Burt.
Water Resources Research, Vol 10, No 1, p 93-97, February 1974. 4 fig, 11 ref.

Descriptors: *Water temperature, *Reservoirs, *Thermal stratification, Forecasting, Climatology, Heat budget, Discharge(Water), Northwest U.S.

Systems are available for forecasting downstream water temperatures for water passing through manmade impoundments. Two forecasts were made for deep, stratified reservoirs in the Northwest. The forecasts were made before the dams had been constructed. Water temperature observations made below the dams after they were constructed are compared with the original forecasts. In both cases the forecasts agreed very well with the observations. A forecast for a high dam and a reservoir with near-surface outlets is also compared with observed temperatures, but this agreement is not as good as that for the reservoirs with low outlets. (Knapp-USGS)
W74-04807

A STUDY ON THE ACCURACY OF RUNOFF ANALYSIS FOR PUMPING DRAINAGE IN PADDY FIELD AREA (IN JAPANESE),
Shimane Univ., Matsue (Japan). Faculty of Agriculture.
R. Tanaka.
Bull Fac Agric Shimane Univ. 5. p 71-75, 1971, Illus, English summary.
Identifiers: *Drainage, *Paddy field, Pumping, Runoff analysis, *Hydrographs.

In a paddy field area, a runoff hydrograph under rainstorm usually tends to have an extremely smooth shape and long period of runoff because of storage and flood. Therefore, the unit time and the basic rainfall to be used for runoff analysis of pumping drainage should be decided after general consideration based on these characteristics. Investigations in a paddy field area of Anba river near Lake Shinji, Shimane Prefecture (Japan), indicated the reasonable unit time for runoff analysis is about 6 hr and a 3-day storm should be used as the basic rainfall.--Copyright 1973, Biological Abstracts, Inc.
W74-04811

UTILIZATION OF NUTRIENTS FROM SOIL AND FERTILIZERS BY PASTURE GRASS AS DEPENDENT ON SOIL MOISTURE (IN RUSSIAN),
N. P. Nasonova.
Agrokhimiya. 4. p 61-65, 1972.
Identifiers: *Fertilizers, Irrigation, Moisture, Nitrates, *Nutrients, *Pasture grass, Soils, Potassium, Phosphorus.

Application of NH_4NO_3 to irrigated and non-irrigated soils low in N increased significantly the utilization of fertilizer P and K by the plants. Nutrient utilization sharply increased with irrigation.--Copyright 1973, Biological Abstracts, Inc.
W74-04820

4B. Groundwater Management

STUDIES ON THE VALIDITY OF DARCY'S LAW FOR FLOW IN NATURAL SANDS,
Georgia Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W74-04307

SOUTHWESTERN GROUNDWATER LAW: A TEXTUAL AND BIBLIOGRAPHIC INTERPRETATION,
Arizona Univ., Tucson. Office of Arid Lands Studies.
J. R. Chalmers.
Available from the National Technical Information Service as PB-228 130, $6.00 in paper copy, $1.45 in microfiche. Arid Lands Resource Information Paper, No. 4, 1974. 229 p, 18 fig, 10 tab, 1 map, 180 ref. OWRR W-161 (No 9071) (1). 14-31-0001-9071.

Descriptors: *Groundwater, *Judicial decisions, *Legal aspects, *Southwest U.S., *Water law, Arizona, California, Colorado, Nevada, New Mexico, Texas, Utah, *Bibliographies, Conjunctive use, Groundwater mining, Institutional constraints, Irrigation water, Overdraft, Pumping, *Prior appropriation, Reasonable use, Surface-groundwater relationships, *Water rights, Water allocation(Policy), Water management(Applied), Water resources development.
Identifiers: Correlative rights, English rule, Agricultural use of water, Critical groundwater areas.

An attempt is made to bring together up-to-date information on the interpretation of groundwater law doctrines and applied water management policies in the southwestern states of Arizona, California, Colorado, Nevada, New Mexico, Texas, and Utah, where none is able to meet present water demand from surface supplies. The resulting mining of groundwater, largely to meet irrigation needs, is creating a critical situation that each of the states covered seeks to meet in a variety of ways. The doctrines of correlative rights, the English common law, prior appropriation and its contemporary modifications, are discussed, state by state. While Arizona has been selected to serve as a case study to put the problem of a diminishing groundwater supply in perspective, there is also a chronological survey of the development of groundwater rights law for each of the states. A final chapter deals with the concept of a statutory revision of Arizona's code, with a modified prior appropriation doctrine recommended. Appended is a 180-item computerized annotated bibliography. (Paylore-Arizona)
W74-04460

THE NEED OF GEOLOGICAL INVESTIGATIONS FOR THE DEVELOPMENT OF THE GROUND WATER RESOURCES OF THE REPUBLIC OF KOREA,
Geological Survey, Reston, Va. Water Resources Div.
J. T. Callahan, and Il Choi Seung.

Journal of the Geological Society of Korea, Vol 9, No 1, p 24-29, March 1973.

Descriptors: *Geologic mapping, *Hydrogeology, *Exploration, *Foreign research, *Groundwater, Mapping, Data collections, Hydrologic data.
Identifiers: *Republic of Korea.

The exploration for and inventory of the groundwater resources of Korea should be based on geologic maps of scale ranging from 1:50,000 to 1:10,000. The different rock formations must be delineated and classified according to the depth of well drilling needed, the yield of the rocks to wells, and the chemical quality of the contained groundwater. The investigation of the groundwater resources of Korea has only begun. The work necessary to fully define and develop the resources will require the efforts of many geologists during the coming three decades. (Knapp-USGS)
W74-04466

HYDROGEOLOGIC CHARACTERISTICS OF THE SURFICIAL AQUIFER IN NORTHWEST HILLSBOROUGH COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2F.
W74-04468

EVALUATION OF THE GROUND-WATER SUPPLY AT EIGHT SITES IN GLACIER NATIONAL PARK, NORTHWESTERN MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 2F.
W74-04469

A PROPOSAL FOR THE INVESTIGATION OF POSSIBLE GROUND-WATER CONTAMINATION IN THE BANGOR AREA, KITSAP COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 5B.
W74-04491

RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF CIMARRON COUNTY, OKLAHOMA,
Geological Survey, Washington, D.C.
D. B. Sapik, and R. L. Goemaat.
For sale by U.S. Geological Survey 20242, Price $1.25 per set. Hydrologic Investigations Atlas HA-373, 1973. 3 sheets, 3 map, 1 tab, 17 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water quality, *Oklahoma, Water utilization, Irrigation, Water supply, Water wells, Water level fluctuations, Water yield, Groundwater recharge, Water analysis, Chemicals, *Mapping, Geology, Hydrographs, Hydrologic data.
Identifiers: Cimarron County(Okla).

Groundwater resources are described for Cimarron County in the Oklahoma Panhandle. The county depends almost entirely on groundwater for its water supply. Where present, the Ogallala Formation is the principal aquifer. The western half of the county is also underlain by the Dakota Sandstone and the Cheyenne Sandstone Member of the Purgatoire Formation, both of which may yield enough water for irrigation. As a result of accelerated development of groundwater for irrigation that began in 1955, water levels in the Ogallala have declined in a few areas of the county. During 1966 about 70,300 acres were irrigated with groundwater. Assuming an average application of 1.2 acre-feet per year per acre, groundwater pumpage for irrigation during 1966 was estimated to be 80,000 acre-feet. This estimate illustrates the magnitude of increase in pumpage over the 175 acre-feet per year estimated for 1938-40. In some parts of Cimarron County the dissolved-solids and fluoride content of groundwater exceed standards set by the U.S. Public Health Service for domestic use. (Woodard-USGS)
W74-04495

COMMUNITY WATER SUPPLY.
Agency for International Development, Washington, D.C. Office of the War on Hunger.
Bibliography Series: Health No. 1, July 15, 1969.

Descriptors: *Bibliographies, Information retrieval, Planning, *Water supply, Groundwater, Wells, Construction, Management, Materials, Design, Training, Waste water treatment, *Public health.
Identifiers: *Rural water supply, *Urban water supply, Small wells manual.

This bibliography of 58 items is a guide to community water supply oriented publications of the Agency for International Development (AID) and other agencies working in the field of development assistance. All documents can be obtained at the AID Reference Center. Entries are referenced by subject and program level. Entries by subject include: Construction; Ground Water; Health Aspects of Water; Management; Materials and Equipment; Planning; Research; Rural Water Supply; Systems Design; Training; Urban Water Supply; and Waste Water Treatment. Listings by program level are divided into Worldwide Programs, Regional Programs, and individual Country Programs. All materials are cross referenced. (Hoffman-North Carolina)
W74-04510

ECONOMIC ASPECTS OF GROUND WATER RESOURCES AND REPLACEMENT FLOWS IN SEMIARID AGRICULTURAL AREAS,
New Mexico Univ., Albuquerque.
M. Gisser, and A. Mercado.
American Journal of Agricultural Economics, Vol 55, No 3, p 461-466, August 1973. 2 fig, 14 ref.

Descriptors: *Groundwater management, *Irrigation water, *Project planning, *Economic feasibility, *Water demand, Hydrologic aspects, *Semiarid climates, Agriculture, Aquifers, Artificial recharge, Alternative planning, Costs, Mathematical models, Systems analysis, Profit, Optimimum development plans.
Identifiers: *Replacement flow.

In semiarid areas where farmers are faced with falling water tables, hydrology and economics must be combined in an integrated model. A single cell hydrologic model of an aquifer in a semiarid region is integrated with an agriculture (linear) negatively sloped demand function for irrigation water. Groundwater and replacement flow are charged artificially into the ground. The aquifer benefits from a significant natural recharge and loses water via natural discharge, which is functionally related to water level. Concern is with the long-run steady-state solutions characterized by an eventual equilibriim in which, if necessary, with the help of artificial recharge, overdraft is reduced to zero. Essentially, the economic problem is to select the replacement flow project that will leave the farm with the maximum profit (net income) and an aquifer that is in steady state. Given pumping and replacement flow costs, only one project (as proposed to a variety) yields simultaneously maximum profit and steady-state solution. The model presented can aid policy makers in solving problems from overdraft leading to a falling water table and in examining the profitability of importing water from surplus areas and artificially recharging the aquifer. (Bell-Cornell)
W74-04563

POSSIBLE APPLICATION OF REMOTE SENSING FOR UNDERGROUND WATER EXPLORATION IN TURKEY,
State Hydraulic Works, Ankara (Turkey). Dept. of Hydrographic Mapping and Photo Geology.
For primary bibliographic entry see Field 7B.
W74-04568

GROUNDWATER INVESTIGATION AND MANAGEMENT IN IRAN,
Ministry of Water and Power, Tehran (Iran).
For primary bibliographic entry see Field 7B.
W74-04569

WATER RESOURCES APPLICATIONS,
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 7B.
W74-04584

GROUND WATER AND THE GEOTHERMAL RESOURCE.
Geraghty and Miller, Port Washington, N.Y.
Special Report, September 1973. 14 p, 8 fig.

Descriptors: *Geothermal studies, *Thermal water, Thermal springs, *Reviews, Heat flow, Thermal power, *Groundwater.
Identifiers: *Geothermal power.

Groundwater is one of the two basic ingredients in the geothermal energy resource. Most of the hot waters and steam in known geothermal systems are of meteoric origin and not produced from magmas as had been thought previously. Thus, the water involved is ordinary groundwater and the quantity available in a geothermal system is determined by the same geologic factors that control the occurrence and movement of all subterranean waters. Heat is the other basic ingredient and its position and quantity in relation to the available groundwater determines the character of the geothermal resource and eventually its usefulness to man. (Knapp-USGS)
W74-04586

AVAILABILITY OF GROUND WATER IN THE WINNSBORO AREA, LOUISIANA,
Geological Survey, Baton Rouge, La.
M. S. Whitfield, Jr.
Louisiana Department of Public Works Water Resources Special Report No 1, December 1973. 9 p, 1 fig, 1 plate, 2 tab.

Descriptors: *Groundwater, *Water quality, *Louisiana, *Iron, Hardness(Water), Water yield, Withdrawal, Water levels, *Alluvial aquifers, *Chlorides.
Identifiers: Winnsboro(La).

Sand and gravel deposits of the Mississippi River alluvial aquifer are 80-100 feet thick in the Winnsboro area of Louisiana and yield as much as 4,000 gallons of water per minute. In most of the area the groundwater is hard to very hard and has a high iron concentration. Chloride concentrations have increased from 62 mg per liter in early 1960 to 436 mg per liter in October 1973. This change is apparently related to increased pumpage in the Winnsboro well field over the past 20 years. (Knapp-USGS)
W74-04596

A DESIGN PROCEDURE FOR THE CONJUNCTIVE USE OF SURFACE AND GROUNDWATER STORAGES,
New South Wales Univ., Kensington (Australia).
P. R. Johnston, E. M. Laurenson, and D. T. Howell.
Australian Water Resources Council Technical Paper No 3, 1973. 40 p, 16 fig, 4 tab, 2 map, 33 ref. Research Project 68/12.

Descriptors: *Conjunctive use, *Water storage, *Australia, *Dynamic programming, *Surface-groundwater relationships, Water yield, Planning, Water resources development, Water management(Applied), *Optimum development plans, Design criteria.
Identifiers: Hunter Valley(NSW-Australia).

A procedure was developed for determining the optimum development for surface water and groundwater in a valley. The optimum size for the surface reservoir, the required number of bores or wells, and sizes of other components were determined in the Upper Hunter Valley, New South Wales, Australia. The procedure was based on the use of dynamic programming. The procedure could be used for the design of a system required to satisfy either an agricultural or urban demand. It could also be used as part of a procedure to solve a larger problem, where the aim is not merely to determine a least cost design for a given target level of water supply, but to decide on an optimal level of water supply to maximize net benefits. Because inadequate data are likely to be available for the design of a new system, the method may find more application in the design of modifications to existing systems. (Knapp-USGS)
W74-04598

GROUND-WATER DATA FOR HARRIS COUNTY, TEXAS: VOLUME I. DRILLERS' LOGS OF WELLS, 1905-71.
Geological Survey, Austin, Tex.
Texas Water Development Board Report 178, November 1973. 421 p, 1 fig, 5 ref.

Descriptors: *Drillers logs, *Data collections, *Water wells, *Hydrologic data, *Texas, Discharge(Water).
Identifiers: Harris County(Texas).

The groundwater data-collection program in Harris County, Texas, consists of an inventory of new large-capacity and other selected wells, the collection of water samples from wells for chemical analyses, an inventory of groundwater pumpage, water-level measurements in observation wells, pumping tests on large-capacity wells, and compilation of information on land-surface subsidence. Drillers' logs of approximately 1,200 wells in Harris County that have been collected as part of the inventory from 1905 to 1971. (Knapp-USGS)
W74-04602

HYDROLOGIC AND GEOLOGIC CONSIDERATIONS FOR SOLID-WASTE DISPOSAL IN WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5E.
W74-04605

ECONOMIC POWER FROM GEOTHERMAL HEAT,
J. H. Anderson.
Reprint: J. Hilbert Anderson - Consulting Engineer, 1615 Hillock Lane, York, Pennsylvania, August 12, 1972, 4 p, 6 fig, 7 ref.

Descriptors: *Electric power production, *Geothermal studies, *Heat transfer, *Heat exchangers, *Design criteria, Heat flow, Gases, Fluids, Heated water, Cost analysis, Construction costs, Well drilling, Feasibility, Waste water disposal, Condensers.
Identifiers: Geothermal energy.

A discussion of geothermal energy is presented which includes consideration of the possibility for its conversion into electrical energy, different techniques to accomplish such a conversion and the general costs involved. Geothermal energy can be an economical source of power if the heat sources are sufficiently close to the surface to allow reasonably easy access. Methods of bringing this heat to the surface for conversion include heated water flow, flashing of superheated water through a cold water zone, and hot water pumped to the surface in connection with a heat exchanger. The latter process eliminates the disadvantages of energy loss and corrosion associated with the first two methods. In the process the hot water is pumped to the surface under pressure to prevent it from flashing into steam. The heat is exchanged to another fluid favorable for vaporization, such as isobutane. The cost of energy per kilowatt-hour depends upon the temperature of the well, the depth of the well and the efficiency of the heat transfer process. Enclosed graphs depict costs per depth of drilling wells, a heat transfer schematic, a performance curve for an isobutane cycle and water rates and thermal efficiency. (Jerome-Vanderbilt)
W74-04766

SURFACE- AND GROUND-WATER CONDITIONS DURING 1959-61 IN A PART OF FLETT CREEK BASIN, TACOMA, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2E.
W74-04796

THE OPERATION OF A STREAM-AQUIFER SYSTEM UNDER STOCHASTIC DEMANDS,
Geological Survey, Reston, Va.
T. Maddock, III.
Water Resources Research, Vol 10, No 1, p 1-10, February 1974. 2 fig, 5 tab, 19 ref.

Descriptors: *Conjunctive use, *Stochastic processes, Statistical methods, *Water demand, Water yield, *Surface-groundwater relationships, Artificial recharge, Drawdown, Withdrawal.

It is possible to develop operating rules for the conjunctive use of surface water and groundwater when the demand and supply sources are stochastic. These rules allow the quantities of water pumped from wells, diverted from streams, spread, and returned to the stream after use to be determined for a given time period even if the required needs and availability of supply are uncertain at the beginning of the time period. These rules are dependent on a technological function relating streamflow interaction with well pumping and with the statistics of the demands, streamflow, pumping, and drawdowns. The discounted expected cost and the operating rules are functions of not only the expected value of the demands but also its variance and persistence (as measured by an autocorrelation function). The discounted expected cost has high sensitivity to demand variances and some sensitivity to persistence. (Knapp-USGS)
W74-04808

4C. Effects On Water Of Man'S Non-Water Activities

ENVIRONMENTAL CONSIDERATIONS FOR THE UTILIZATION OF PERMAFROST TERRAIN,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04407

CONTROL OF PERMAFROST DEGRADATION BENEATH A ROADWAY BY SUBGRADE INSULATION,
Alaska State Dept. of Highways, College.
D. C. Esch.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 608-622, 1973. 10 fig, 1 tab, 8 ref.

Descriptors: *Permafrost, *Subsidence, *Road construction, *Insulation, *Alaska, Thawing, Consolidation, Peat, Frozen soils, Frozen ground, *Degradation(Slope).

Newly constructed roadways crossing permafrost terrain originally covered with vegetation have the effect of increasing the amplitude of the seasonal surface and subsurface temperature variations and also of altering the mean annual surface temperature. Readjusting of the permafrost table to the new thermal conditions occurs over a period of years. Readjustment is accompanied by roadway surface settlement in areas where permafrost degradation occurs in soils having high frozen moisture contents or segregated ice formations or deposits. The Alaska Department of Highways, in 1969, installed two different thicknesses of extruded polystyrene foam insulation boards beneath a newly constructed roadway in a region of relatively warm permafrost. Roadway fill sections constructed over a frozen peat subgrade, with both 5.1- and 10.2-cm-thick insulation layers, performed very well during the first 3 years after construction, as evidenced by the fact that surface settlement has been very small and very uniform. Adjacent normally constructed fill sections showed the average settlement to be 8 times greater than the 5-cm insulation section and 11 times greater than the 10-cm section, with severe variations in settlement magnitude. (See also W74-04346) (Knapp-USGS)
W74-04409

CONTROL OF CULVERT ICING,
Cold Regions Research and Engineering Lab., Hanover, N.H.
D. A. Gaskin, and L. E. Stanley.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 629-636, 1973. 7 fig, 1 tab, 4 ref.

Descriptors: *Ice, *Culverts, *Drainage, *Arctic, *Deicers, Permafrost, Melting, Heating.
Identifiers: *Ice control.

The U. S. Army Cold Regions Research and Engineering Laboratory conducted field and laboratory studies from 1966 to 1971 as a joint research project with the Alaska Department of Highways and the U.S. Department of Transportation on the prevention and control of culvert and road icing. A laboratory study was made of culvert icing control using electric heat cables. The major heat transfer mechanism for melting and maintaining an open, freely draining hole in a culvert subject to groundwater icing is convection. This implies that the optimum location for the cable is near the bottom of the culvert, where the largest cross-section hole can be melted without thawing the frozen soil that surrounds the culvert. A proportional controller system was useful for spring icing problems. The sensor can be placed downstream of the problem drainage structure and an electric heat cable installed. When the system is energized, it will keep the water continuously flowing through the drainage structure above the freezing point and so minimize or eliminate the culvert icing blockage. (See also W74-04346) (Knapp-USGS)
W74-04411

SOME EFFECTS OF SURFACE DISTURBANCE ON THE PERMAFROST ACTIVE LAYER AT INUVIK, N.W.T., CANADA,
Geological Survey of Canada, Ottawa (Ontario).
J. A. Heginbottom.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 649-657, 1973. 6 fig, 3 tab, 15 ref.

Descriptors: *Permafrost, *Environmental effects, *Erosion, *Thawing, Canada, Frozen soils, Subsidence, Soil engineering, Soil strength, Soil mechanics.

In permafrost active layer in the forest-tundra environment of northern Canada, the effects of disturbance of the ground surface on the active layer were studied. This information is used in the production of guidelines and regulations to minimize some of the undesirable effects of land use and northern development. The structure of the active layer in this area is an important factor. The most obvious feature of the ground surface in

the Inuvik area is its hummocky nature. The upper layer of the ground is a complex of mineral soil hummocks separated by shallow, moss-filled trenches. The hummocks are composed of a dense, grey-brown clay-silt, showing little or no soil profile development. In undisturbed areas, some hummocks have mineral soil exposed at the surface, but most are covered with a thin layer (less than 5 cm) of humus, mosses, and lichens. The one factor that overrides all others in controlling the effects of any terrain disturbance on the permafrost active layer is the intensity or severity of the original distrubance. Variations in the response of the terrain due to different original terrain conditions are much less. (See also W74-04346) (Knapp-USGS)
W74-04413

CORPS OF ENGINEERS TECHNOLOGY RELATED TO DESIGN OF PAVEMENTS IN AREAS OF PERMAFROST,
Corps of Engineers, Washington, D.C.
F. B. Hennion, and E. F. Lobacz.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 658-664, 1973. 1 fig, 8 ref.

Descriptors: *Permafrost, *Frost heaving, *Road construction, Design, Thawing, Freezing, Subsidence.

Design of pavements subject to seasonal thaw-freeze cycles is based on either of two basic concepts: control of surface deformation resulting from frost action, or provision of adequate bearing capacity during the most critical climatic period. Waterproofing membranes may be used to protect dry high-density fine-grained soil layers from water infiltration and subsequent loss of strength. Membrane encapsulated soil layers (MESL) may be used in permanent pavement systems. In August 1970, an MESL test section was constructed at the Army Cold Regions Research and Engineering Laboratory Alaska Field Station using Fairbanks silt as the embankment encapsulated soil. The section has a length of 76 m, a traffic surface width of 6-6.7 m, and a thickness from 0 to 0.9 m. Both top and bottom membranes are polypropylene waterproofed with a single hand application of about 2.2 cubic decimeters per sq m of emulsified asphalt. The MESL concept appears to be a feasible method of utilizing local, normally unsatisfactory materials as replacements for clean granular base and subbase coarse materials. Moisture migration in thick silty encapsulated layers presents a design problem; however, this can be minimized by utilizing horizontal moisture barriers (probably formed in place). (See also W74-04346) (Knapp-USGS)
W74-04414

PERMAFROST PROTECTION FOR PIPELINES,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 2C.
W74-04415

PERMAFROST-RELATED ENGINEERING GEOLOGY PROBLEMS POSED BY THE TRANS-ALASKA PIPELINE,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 8D.
W74-04416

LONG-TERM EFFECTS OF VEGETATIVE COVER ON PERMAFROST STABILITY IN AN AREA OF DISCONTINUOUS PERMAFROST,
Cold Regions Research and Engineering Lab., Hanover, N.H.
K. A. Linell.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 688-693, 1973. 4 fig, 2 tab, 10 ref.

Descriptors: *Permafrost, *Subsidence, *Thawing, *Vegetation effects, Forests, Tundra, *Alaska, Arctic, Frozen soils, Frozen ground, Soil physical properties, Soil mechanics.

The relationship between vegetative cover and permafrost degradation was studied at Fairbanks, Alaska. The data extend through 1972, 26 years after the start of the experiment. The terrain at the station has a comparatively smooth, gentle slope to the west, providing good surface drainage except at the lowest elevations where swampy conditions exist. The ground under the station is permanently frozen, with the depth of permafrost approaching 60 m. Only the original densely tree covered section has remained free from permafrost degradation. In both the cleared and stripped sections, permafrost degradation is still continuing, though at a distinctly slower rate than in the area that was only cleared. In an environment like that at Fairbanks the maintenance or re-establishment of a random, mixed-type low vegetative cover cannot be counted on to stop or prevent permafrost degradation in an area subject to surface disturbance. (See also W74-04346) (Knapp-USGS)
W74-04417

ENCOUNTERING MASSIVE GROUND ICE DURING ROAD CONSTRUCTION IN CENTRAL ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
N. Smith, and R. Berg.
In: International Conference in Permafrost 2nd, Yakutsk, USSR 1973. p 730-736, 1973. 17 fig, 4 ref.

Descriptors: *Permafrost, *Road construction, Excavation, *Alaska, Arctic, Thawing, Revegetation.

Several cuts along a new roadway in Central Alaska had exposed massive ice inclusions and wedges. Eight relatively deep cuts were made in high ice content soils. Guidelines are given for making cuts through ice-rich soils: avoid north-facing slopes when possible; make vertical backslopes on cuts; provide a wide ditch at the base of the cut to allow removal of material if necessary to allow deposition of some overlying material during the stabilization process; and clear trees and brush from the top of the slope to a distance about equal to the height of the slope. (See also W74-04346) (Knapp-USGS)
W74-04420

THE USE OF POLYURETHANE FOAM PLASTICS IN THE CONSTRUCTION OF EXPEDIENT ROADS ON PERMAFROST IN CENTRAL ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 8G.
W74-04421

EFFECTS OF GROUND-ICE VARIABILITY AND RESULTING THAW SETTLEMENTS ON BURIED WARM-OIL PIPELINES,
Mackenzie Valley Pipeline Research Ltd., Calgary (Alberta).
T. L. Speer, G. H. Watson, and R. K. Rowley.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973. p 746-752, 1973. 5 fig, 2 tab, 6 ref.

Descriptors: *Permafrost, *Subsidence, Frozen soils, Soil types, *Canada, Arctic, Frost heaving, Ice, Soil mechanics, *Pipelines, *Oil fields.

Field and laboratory studies were undertaken to determine the type and variability of ground ice occurring in clay and silt permafrost soils and to establish limiting pipe burial criteria. Specific objectives were to derive a general relationship between frozen bulk density and thaw settlement for permafrost mineral soils; to determine the ice variation for specific terrains in which the proposed pipeline might be buried; to determine the representative potential total and differential settlements for these specific terrains; and to establish a method of using both the frozen bulk density and thaw settlement data (total and differential) obtained to establish practical design limits for a warm buried pipeline. (See also W74-04346) (Knapp-USGS)
W74-04422

STATISTICAL ANALYSIS OF HYDROGRAPH CHARACTERISTICS FOR SMALL URBAN WATERSHEDS,
Tracor, Inc., Austin, Tex.
For primary bibliographic entry see Field 2A.
W74-04459

EFFECTS OF URBANIZATION ON FLOODS IN THE DALLAS, TEXAS, METROPOLITAN AREA,
Geological Survey, Austin, Tex.
G. R. Dempster, Jr.
Water-Resources Investigations 60-73, January 1974. 55 p, 10 fig, 11 tab, 11 ref.

Descriptors: *Urban hydrology, *Urban runoff, *Texas, *Mathematical models, Rainfall-runoff relationships, Peak discharge, Regression analysis, Flood frequency.
Identifiers: *Dallas(Tex).

The effects of urbanization on flood characteristics of streams in the Dallas metropolitan area were studied by use of a digital model of the hydrologic system. The model was calibrated by using observed rainfall and runoff data from 19 storms in six basins having various degrees of urbanization. The calibrated models were used with a 57-year rainfall record to simulate 57-year records of annual peak discharges in 14 basins. The flood-frequency characteristics were defined by fitting the simulated 57-year records to log-Pearson Type III distributions. Regional peak discharge equations, which can be used to determine the maximum rates of discharge that could be expected to be equaled or exceeded on the average of once in 1.25, 2, 5, 10, 25, and 100 years, were derived from multiple-regression analyses. The relationships among flood frequency, drainage area, and a coefficient of impervious area are given in a nomograph. In a fully developed residential area, the flood peaks will be 1.2 to 1.4 times those from an undeveloped area, and the annual direct runoff will be about double that from an undeveloped area. (Knapp-USGS)
W74-04483

ESTIMATING THE BENEFITS OF STREAM VALLEY AND OPEN SPACE PRESERVATION PROJECTS,
Regional Science Research Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 6B.
W74-04500

SUMMARY REPORT OF METROMEX STUDIES, 1971-1972.
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W74-04509

HYDROLOGIC INVESTIGATION AND DESIGN IN URBAN AREAS--A REVIEW,
Snowy Mountains Engineering Corp., Cooma (Australia).
For primary bibliographic entry see Field 2A.
W74-04597

URBANIZATION: A HYDROLOGICAL HEADACHE,
Lund Inst. of Tech. (Sweden).
G. Lindh.
Ambio. Vol 1, No 6, p 185-201. 1972. Illus.

Identifiers: Ground water, *Hydrological cycle, Mathematical methods, Statistical studies, *Urbanization, Water balance, *Water quality, *Water quantity.

Urbanization disrupts the natural hydrological cycle and creates problems concerning the quality, quantity and distribution of water. Urbanization causes changes in the microclimate, the ground's hydrological response, the quality and quantity of groundwater, and the water balance. Urbanization often makes it necessary to transfer water from other regions. There is presently a great need for research on urban hydrology. The use of statistical mathematical methods, especially systems analysis, has spurred progress in certain areas of hydrology.--Copyright 1973, Biological Abstracts, Inc.
W74-04642

4D. Watershed Protection

WATER PROBLEMS OF THE TISZA RIVER IN HUNGARY AND COOPERATION AMONG TISZA BASIN COUNTRIES IN THE FIELD OF WATER MANAGEMENT (VODNYYE PROBLEMY REKI TISY V VENGRII I SOTRUDNICHESTVO STRAN BASSEYNA TISY V OBLASTI VODNOGO KHOZVAYST VA),
For primary bibliographic entry see Field 4A.
W74-04574

MUDFLOWS (SELEVYYE POTOKI),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
G. D. Rozhdestvenskiy.
Vodnyye Resursy, No 3, p 171-174, 1973. 7 ref.

Descriptors: *Mudflows, *Sediment control, Damages, Forecasting, Planning.
Identifiers: *USSR.

Mudflows are widespread in many mountainous and piedmont regions of the Soviet Union. Mudflows occur most frequently in the Caucasus, Transcaucasus, Tien-Shan, Karatau, Kopet-Dag, the Baykal region, the Crimea, and the Carpathians. Mudflows also form in the Polar Urals, the Khibiny Mountains and on the Central Siberian Plateau, Sakhalin, and Kamchatka. According to incomplete figures, over 5,000 cases of mudflows have already been recorded in the Soviet Union. In mountainous and piedmont regions of the Caucasus and Soviet Central Asia mudflows have caused extensive damage to railroads, including the Transcaucasus, Azerbaydzhan, Ashkhabad, Tashkent, and Kazakh lines. Mudflow control is divided into active measures aimed at preventing formation of catastrophic mudflows and passive measures designed to control mudflows by incorporating an additional storage volume in reservoirs for sediment accumulation or by diverting mudflows to areas of lesser economic significance. Mudflow control in the Soviet Union (and abroad) is divided into (1) engineering measures and (2) afforestation and phytomeliorative measures. It is estimated that by 1980 about 670 million rubles will have been spent on combating mudflows and floods in the Soviet Union. Some common features of mudflow deposits and conditions favoring their formation are examined. (Josefson-USGS)
W74-04581

RESPONSE AND RECOVERY OF A PIEDMONT WATERSHED FROM TROPICAL STORM AGNES, JUNE 1972,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 2J.
W74-04805

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

A DETAILED INVESTIGATION OF THE SOCIOLOGICAL, ECONOMIC, AND ECOLOGICAL ASPECTS OF PROPOSED RESERVOIR SITES IN THE SALT RIVER BASIN OF KENTUCKY,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 2A.
W74-04310

DETERMINATION OF THE COMPLEXING CAPACITY OF NATURAL WATER,
North Carolina State University at Raleigh. Department of Chemistry.
For primary bibliographic entry see Field 2K.
W74-04312

REMOTE SENSING IN SAMPLING SITE LOCATION IN LAKES AND STREAMS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
J. D. Womack.
Available from National Technical Information Service as PB-227 846 $4.00 in paper copy, $1.45 in microfiche. University of Tennessee Water Resources Research Center Research Report No 37, 1974, 8 p. OWRR A-025-TENN(1). OWRR 14-31-0001-3843.

Descriptors: *Remote sensing, *Aerial photography, *Mapping, *Sampling, Lakes, Streams, Design, *Tennessee, Water quality.
Identifiers: *Fort Loudoun Reservoir(Tenn.).

This project was intended to investigate the use of remote sensing techniques in the design of sampling programs on large lakes and streams. The wide overview of aerial photography and infrared thermal mapping scanners provide means of visualizing and measuring variations in water characteristics which might require compensation for representative sampling. Several sites on Fort Loudoun Lake were sampled to determine whether persistent patterns of water quality variations existed. The parameters measured were temperature, measured with a Barnes Radiometer, turbidity and color. Persistent patterns were found in the vicinity of tributary inflows and it was concluded that aerial techniques would be useful in mapping the extent and shape. The Project was terminated before significant aerial imagery could be acquired.
W74-04313

ENVIRONMENTAL MONITORING AND DISPOSAL OF RADIOACTIVE WASTES FROM U.S. NAVAL NUCLEAR-POWERED SHIPS AND THEIR SUPPORT FACILITIES, 1972,
Department of the Navy, Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-04441

A HISTORY AND PRELIMINARY INVENTORY REPORT ON THE KENTUCKY RADIOACTIVE WASTE DISPOSAL SITE,
Kentucky Dept. of Health, Frankfort. Radiological Health Program.
For primary bibliographic entry see Field 5B.
W74-04442

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE ROBERT EMMETT GINNA NUCLEAR POWER PLANT, ONTARIO, NEW YORK, SEPT. 8, 1970.
EG and G, Inc., Las Vegas, Nev.
Available from NTIS, Springfield, Va., as Rept. No. ARMS-70-6-10. $4.00 per copy, $1.45 microfiche. Report No. ARMS-70-6-10, October 1973. 18 p, 2 fig, 3 tab, 3 ref.

Descriptors: *Nuclear powerplants, Effluents, Surveys, Measurement, *Radioactivity, Water pollution, Water pollution sources, Air pollution, Fallout, *Lake Ontario, *New York, Food chains, Public health, *Remote sensing.
Identifiers: *Pressurized water reactor.

The Aerial Radiological Measuring System was used to survey the area surrounding the Robert Emmett Ginna Nuclear Power Plant during September 1970. The survey measured terrestrial gamma radiation. A high-sensitivity detection system collected gamma ray spectral and gross count data. The data were then computer processed into a map of a 325-square-mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal background radiation. (Houser-ORNL)
W74-04446

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE LA CROSSE BOILING WATER REACTOR, GENOA, WISCONSIN, JULY 1968.
EG and G, Inc., Las Vegas, Nev.
Available from NTIS, Springfield, Va., as Report No. ARMS-68.6.5. $4.00 per copy, $1.45 microfiche. Report No. ARMS-68.6.5 (EGG-1183-1584), October 1973. 17 p, 2 fig, 3 tab, 3 ref.

Descriptors: *Monitoring, *Nuclear powerplants, Effluents, Surveys, Measurement, Water pollution, *Radioisotopes, Air pollution, Fallout, Food chains, Milk, Dairy industry, *Mississippi River Basin, Public health, *Wisconsin, *Remote sensing.
Identifiers: *Boiling water reactor.

The Aerial Radiological Measuring System was used to survey the area surrounding the La Crosse Boiling Water Reactor during July 1968. The survey measured terrestrial gamma radiation. A high-sensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 625-square-mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal background radiation. (Houser-ORNL)
W74-04447

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE VERMONT YANKEE GENERATING STATION AND THE YANKEE NUCLEAR POWER STATION, SEPTEMBER 18, 1970.
EG and G, Inc., Las Vegas, Nev.
Available from NTIS, Springfield, Va., as Rept. No. ARMS-70.6.11. $4.00 per copy, $1.45 microfiche. Report No. ARMS-70.6.11 (EGG-1183-1581), October 1973. 30 p, 12 fig, 5 tab, 5 ref.

Descriptors: *Nuclear powerplants, Effluents, *Radioactivity, *Surveys, Measurement, Monitoring, *Vermont, Massachusetts, Air pollution, Water pollution sources, Fallout, Food chains, Public health, *Remote sensing.
Identifiers: Deerfield River, Ashuelot River, *Boiling water reactor, Pressurized water reactor.

The Aerial Radiological Measuring System was used to survey the area surrounding the Vermont Yankee Generating Station and the Yankee Nuclear Power Station during September 1970. The survey measured terrestrial gamma radiation. A high-sensitivity detection system collected spectral and gross-count data for the flyable portions of the 625-square-mile survey area. Isotopes identified and exposure rates are consistent with normal background radiation. (Houser-ORNL)
W74-04448

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE POINT BEACH NUCLEAR PLANT, TWO CREEKS, WISCONSIN, AUGUST 16 AND 17, 1970.
EG and G, Inc., Las Vegas, Nev.
Available from NTIS, Springfield, Va., as Rept. No. ARMS-70.6.9. $4.00 per copy, $1.45 microfiche. Report No. ARMS-70.6.9 (EGG-1183-1587), October 1973. 18 p, 2 fig, 3 tab, 3 ref.

Descriptors: *Monitoring, *Nuclear powerplant, Effluents, *Radioactivity, Air pollution, Water pollution, Fallout, *Wisconsin, Surveys, Measurement, Instrumentation, *Lake Michigan, Public health, *Remote sensing.

The Aerial Radiological Measuring System was used to survey the area surrounding the Point Beach Nuclear Plant during August 1970. The survey measured terrestrial gamma radiation. A high-sensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 312-square-mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal terrestrial background. (Houser-ORNL)
W74-04449

ENVIRONMENTAL RADIOACTIVITY,
For primary bibliographic entry see Field 5B.
W74-04456

APPROACHES TO STORMWATER MANAGEMENT,
Hittman Associates, Inc., Columbia, Md.
B. C. Becker, M. L. Clar, and R. R. Kautzman.
Available from the National Technical Information Service as PB-228 124, $6.75 in paper copy, $1.45 in microfiche. Completion Report, HIT-563, November 1973. 258 p, 66 fig, 17 tab, 90 ref. OWRR C-4140(No 9025) (1).

Descriptors: *Storage, *Storm runoff, *Flood control, *Detection reservoirs, *Water pollution control, *Design storm, Flood routing, Watershed management, Design criteria, Reviews, Bank storage, Reservoir storage, Underground storage flood hydrology, Urbanization, Retention reservoirs, Erosion control, Flood damage.
Identifiers: *Stormwater management, Storm water detection/retention.

The literature was searched to identify the various techniques, past and present, utilized for the control of stormwater management. Fifteen different basic techniques for stormwater management were selected and grouped under 3 categories: surface detention, subsurface detection, and infiltration systems. The presentation includes a description of the technique, a discussion of its applicability, an example of an actual application where available, and a brief review of the available design, maintenance and construction considerations. Needs for planning, design, maintenance and institutional considerations of stormwater management, are described.
W74-04458

MASS SPECTROMETRY AND INHOMOGENEOUS ION OPTICS,
Rensselaer Polytechnic Inst., Troy, N.Y.
F. A. White.
Available from NTIS, Springfield, Va 22151 NASA CR-2253 Price $4.50 (domestic), $7.00 (foreign); $1.45 microfiche. National Aeronautics and Space Administration Contractor Report CR-2253, November 1973. 127 p, 47 fig, 1 tab, 30 ref. NASA Contract NGL 33-018-053.

Descriptors: *Mass spectrometry, *Pollutant identification, Heavy metals, Trace elements, *Analytical techniques, Ions, Air pollution, Water pollution, Oxides, *Ionization, *Isotope fractionation.
Identifiers: *Metallic oxides.

Magnetic mass spectrometers were studied for use in measuring air and water pollution. The calculations and data necessary for the design of inhomogeneous field mass spectrometers, and the calculation of ion trajectories are presented. Solid state ion detection devices were tested for capability of counting single ions. New techniques in the preparation and operation of thermal-ionization ion sources are described. Data were obtained on the concentrations of copper in rainfall and uranium in air samples using the improved thermal ionization techniques. A closed system static mass spectrometer was designed for isotopic analyses. Instrumental aspects of a four-stage mass spectrometer comprising two electrostatic and two 90 deg magnetic lenses with a 122-cm radius used to study the interaction of ions with solids are summarized. (Knapp-USGS)
W74-04475

EVALUATION AND SIMULATION OF CHEMICAL-QUALITY DATA FOR FIVE MONTANA SAMPLING STATIONS,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 2K.
W74-04484

AIR POLLUTION MEASUREMENTS FROM SATELLITES,
General Dynamics, San Diego, Calif. Convair Aerospace Div.
C. B. Ludwig, M. Griggs, W. Malkmus, and E. R. Bartle.
Available from NTIS, Springfield, Va. 22151 NASA CR-2324, Price $5.50 domestic, $8.00 foreign; $1.45 microfiche. National Aeronautics and Space Administration Contractor Report CR-2324, November 1973. 216 p, 81 fig, 18 tab, 201 ref. NASA Contract NASI-10466.

Descriptors: *Remote sensing, *Air pollution, *Satellites(Artificial), Fluorescence, Spectroscopy, Infrared radiation, Aerosols, *Pollutant identification.

Pollutants can be observed from satellites by either active or passive remote sensing systems. Tropospheric CO, CO2, SO2, NO2, NH3, HCHO, and CH4 can be measured by means of nadir-looking passive systems. Additional species such as NO, HNO3, O3, and water may be measured in the stratosphere through a horizon view. A brief theoretical overview of resonance Raman scattering and resonance fluorescence is given. Several techniques for measuring aerosol in a nadir-looking experiment are examined. Radiance measurements are most promising for general global applications. Stratospheric aerosol may be measured using a sun occulation technique. The instrumentation requirements for both active and passive systems are examined and various instruments under development are described. (Knapp-USGS)
W74-04485

LAKES IN THE BOULDER-FORT COLLINS-GREELEY AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 2H.
W74-04496

SCANNING ELECTRON MICROSCOPY OF FIXED, FROZEN, AND DRIED PROTOZOA,
Illinois Univ., Urbana. Dept. of Zoology.
For primary bibliographic entry see Field 7B.
W74-04497

DETERMINATION OF CHROMIUM IN SEA WATER BY ATOMIC ABSORPTION SPECTROMETRY,
New England Aquarium, Boston, Mass. Research Dept.
T. R. Gilbert, and A. M. Clay.
Analytica Chimica Acta, Vol 67, No 2, p 289-295, Dec. 1973. 2 fig, 3 tab, 9 ref.

Descriptors: *Water analysis, *Pollutant identification, *Chromium, *Sea water, Analytical techniques, *Spectroscopy, Oxidation.
Identifiers: Atomic absorption spectrometry, Wet combustion, Sample preparation(For analysis).

A method for determining Cr in sea water with minimum sample preparation involves oxidation of Cr in the filtered sample with potassium permanganate, followed by extraction with ammonium pyrrolidine dithiocarbamate into MIBK (methyl isobutyl ketone), and atomic absorption spectrometry in a fuel-rich air-acetylene flame. Nonfilterable solids are extracted with 12M HCl and analyzed separately. Detection limits of this technique are 0.05 microgram/liter in the liquid and 0.06 microgram/liter in the particulate phase. (Brown-IPC)
W74-04516

THE ANALYSIS OF ARSENIC IN THE LIPID PHASE FROM MARINE AND LIMNETIC ALGAE,
Central Inst. for Industrial Research, Oslo (Norway).
G. Lunde.
Acta Chem Scand. Vol 26, No 7, p 2642-2644, 1972, Illus.
Identifiers: *Arsenic, Chlorella-Ovalis, Chlorella-Pyrenoidosa, *Limnetic algae, *Marine algae, Oscillatoria-Rubescens, Phaeodactylon-Tricornutum, Sceletonema-Costatum *Algae(Liqud phase), Neutron activation analysis, *Pollutant identification.

The arsenic content in the lipid phase extracted from selected marine and limnetic algae was analyzed by use of neutron activation technique. The arsenic content varied from about 0.5 ppm to 5 ppm. The algae were cultivated in the laboratory using enriched cultures. The following types of algae were investigated: Chlorella ovalis Butcher, Chlorella pyrenoidosa Chick, Oscillatoria rubescens (DC), Phaeodactylon tricornutum Bohlin, and Sceletonema costatum (Grev.) Cleve.--Copyright 1973, Biological Abstracts, Inc.
W74-04557

OVERGROWTH OF OOZE IRON-MANGANESE MICROORGANISMS STUDIED BY ELECTRON MICROSCOPY, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Ozerovedeniya.
R. S. Kutuzova, D. R. Gabe, and I. M. Kravkina.
Mikrobiologiya. Vol 41, No 6, p 1099-1102. 1972, Illus, (English summary).
Identifiers: *Electron microscopy, *Iron manganese microorganisms, *Metallogenium, Microorganisms, Ooze, *Siderococcus, Iron bacteria.

Overgrowth of ooze iron-manganese microorganisms (Metallogenium and Siderococcus) in slotted peloscopes was studied by electron microscopy. A band, covered with a film of collodion or carbon, was inserted between glass bands of the peloscope. Microorganisms, overgrowing the films, were transferred together with the film on copper nets and studied by electron microscopy without any further treatment. The preparations were made by the replica technique when microorganisms overgrew the glass surface of the peloscopes.--Copyright 1973, Biological Abstracts, Inc.
W74-04558

THE EFFECT OF COLLECTING TIME AND GRAIN SIZE ON THE SAMPLING OF STREAM SEDIMENTS FOR GEOCHEMICAL MAPPING IN THE ST. CATHARINES AREA, ONTARIO,
Brock Univ., St. Catharines (Ontario). Dept. of Geological Sciences.

For primary bibliographic entry see Field 2J.
W74-04587

CHEMICAL QUALITY OF STREAMS, ALLEGHENY RIVER BASIN AND PART OF THE LAKE ERIE BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 2K.
W74-04593

ANALYTICAL TECHNIQUES FOR THE DETERMINATION OF PETROLEUM CONTAMINATION IN MARINE ORGANISMS,
Woods Hole Oceanographic Institution, Mass.
J. W. Farrington.
Available from NTIS, Springfield, Va 22151 as AD-766 792, Price $3.00 printed copy; $1.45 microfiche. Technical Report WHOI-73-57, September 1973. 24 p, 1 fig, 89 ref. ONR Contract N00014-66-C0241 NSF Grant GA-35646.

Descriptors: *Pollutant identification, *Analytical techniques, *Chromatography, *Gas chromatography, Fluorometry, *Chemical analysis, *Spectrophotometry, Spectroscopy, Infrared radiation, Fluorescence, Ultraviolet radiation.
Identifiers: Marine organisms.

The composition of hydrocarbons in petroleum and the composition of hydrocarbons isolated from marine organisms were studied to select the best analytical techniques for the quantification of petroleum contamination in marine organisms. Analytical techniques discussed include column, thin layer, and high pressure liquid chromatography; I. R., U. V., and U. V.-fluorescence spectrometry; gas chromatography; mass spectrometry; and combinations of methods. Each technique provides information in some of the categories of characteristics for petroleum hydrocarbons. Gas chromatography provides information about the complexity and molecular weight range. It also detects the presence or absence of certain homologous series. In addition, gas chromatography provides the information about native hydrocarbons and their absolute and relative abundance. Careful application of the suggested techniques will provide information about the presence or absence of petroleum contamination in marine organisms and also provide an estimate of the severity of contamination. (Knapp-USGS)
W74-04594

AVAILABILITY OF GROUND WATER IN THE WINNSBORO AREA, LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 4B.
W74-04596

ANALYSIS OF ORGANIC POLLUTANTS IN WATER AND WASTE WATER,
W. Leithe.
Ann Arbor Science Publishers, Ann Arbor, Michigan. 1973. 213 p, illus., 346 ref. Trans. of Die Analyse der organischer Verunreinigungen in Trink, Brauch-und Abwassern, 1972.

Descriptors: *Water analysis, *Pollutant identification, *Organic compounds, *Water pollution sources, Color, Odor, Sampling, Chromatography, Lipids, Phenols, Detergents, Pesticides, Surfactants, Hydrocarbons, Ureas, Lignins, Humic acids, Analytical techniques.
Identifiers: Cyanides, Fatty(Carboxylic) acids, Sterols, Coprosterols, Uric acid, Nitriloacetic acid, Urochromes, Lignosulfonic acids, Benzpyrene, Carcinogens.

Both general and specific methods of water analysis for organic pollutants are discussed. The following topics are included: Sampling and sample preparation; Quantitative determinations; Subjective tests (for color and odor); Chromatographic methods; and Procedures for determining various types of organic compounds. Major kinds of pollutants for which analytical methods are given include: Volatile fatty acids, cyanides, phenols, detergents, surfactants, nitrilocetic acid, hydrocarbons, chlorinated hydrocarbons, pesticides, urea, uric acid, coprosterols, urochromes, humic acids, lignins, lignosulfonic acids, and 3,4-benzpyrene. (Brown-IPC)
W74-04633

MEASUREMENTS OF THE TURBULENT FLUXES OF MOMENTUM, MOISTURE AND SENSIBLE HEAT OVER THE OCEAN,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 2E.
W74-04673

THIN-LAYER AND GAS-CHROMATOGRAPHIC DETERMINATION OF PHENOLS PRESENT IN WATER, (IN GERMAN),
Mainz Univ. (West Germany). Hygiene Institut.
H. Kunte.
Zentralbl Bakteriol Parasitenkd Infekionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. Vol 155, No 1, p 41-49. 1971. Illus. (English summary).
Identifiers: *Chromatographic analysis, *Gas chromatography, *Phenols, Water analysis, Pollutant identification, Thin-long chromatography.

A method is described by which organic substances are extracted with isopropylether from a 10 l sample of water in a multiple 'cascade distribution process.' The phenolic compounds are separated by extraction with KOH solution and after acidification transferred into ethyl acetate. The ester is concentrated in vacuo and gas chromatographed, the effluent gas stream is directed onto thin-layer plates for further separation and identification. With this method 15 different compounds can be determined qualitatively and quantitatively down to 0.2 microgram/liter.--Copyright 1973, Biological Abstracts, Inc.
W74-04684

DETERMINATION OF MICROGRAM QUANTITIES OF POLYETHYLENE POLYAMINES IN WATER, (IN RUSSIAN),
G. S. Salyamon, and N. A. Petrova.
Gig Sanit. Vol 37, No 5, p 59-63. 1972.
Identifiers: *Amines, Colorimetry, Quinones, Reagents, Water pollution, *Pollutant identification, *Imines, *Colorimetric analysis, Microgram quantities.

The sensitivity of colorimetric analysis of polyamines, based on interaction with eosin and copper sulfate, increases with a decrease in pH of the medium. By adding citrate buffer solution, pH 2.5-2.7, it reaches 0.006 mg/l for polyethyleneimines (PEI) and 0.02-0.2 mg/l for polyethylene polyamines (PEPA). The Cu-eosin reagent permits analysis of high-molecular PEPA in the presence of low-molecular PEPA. Total high-molecular ethyleneamines and low-molecular amines can be determined colorimetrically using p-nitrodiazobenzene. PEPA can be analyzed in the presence of PEI using the known colorimetric reaction for secondary amines with 1,2-naphthoquinone-4-sodium sulfonate. The sensitivity is high (0.02 mg/l).--Copyright 1973, Biological Abstracts, Inc.
W74-04701

RELATIVE EFFICIENCY OF CELL CULTURES FOR DETECTION OF VIRUSES,
Washington Univ., Seattle. School of Public Health and Community Medicine.
M. K. Cooney.
Health Laboratory Science, Vol 10, No 4, p 294-302, October 1973. 8 tab, 10 ref.

Descriptors: *Viruses, *Cultures, *Pollutant identification, *Isolation.
Identifiers: Adenoviruses, Polioviruses, Coxsackie viruses, Phinoviruses, Enteroviruses, Echoviruses, *Myxoviruses, *Cytomegaloviruses, Herpesvirus hominis, Feces, Cell cultures.

Viruses collected from nasal and pharyngeal swabs and fecal specimens were used in a comparison of the relative efficiency of HEK cells and WI-38 cells for isolation of viruses. The HEK cells were more efficient for recovery of adenovirus and poliovirus strains, and coxsackievirus (B group) recovery was limited to HEK. Conversely, WI-38 cells were more efficient for recovery of Herpesvirus hominis and the echovirus types encountered. Recovery of CMV and rhinoviruses was accomplished only in WI-38 cells. Supplemental cell systems were necessary for the recovery of respiratory syncial and, usually, CMV viruses. Mixtures of two viruses in the same specimen were identified much more frequently in HEK cells than in WI-38 cells. (Little-Battelle)
W74-04767

THE DIRECT ENUMERATION OF ESCHERICHIA COLI IN WATER USING MACCONKEY'S AGAR AT 44 C IN PLASTIC POUCHES,
Centraal Instituut voor Voedingsonderzoek TNO, Zeist (Netherlands).
D. A. A. Mossel, and C. L. Vega.
Health Laboratory Science, Vol 10, No 4, p 303-307, October 1973. 2 tab, 36 ref.

Descriptors: *Cultures, *E. coli, *Water analysis, Foods.
Identifiers: *Method validation, *Direct enumeration, Feces, Meats, Culture media, Agars, Counting, Sample preparation, Most probable number, Fecal pollution.

Twenty-five water samples were examined by one of the European MPN standard techniques for E. coli (enrichment in brilliant green bile lactose broth and isolation on MacConkey agar at 44 C followed by MacKenzie, et al modification of Eijkman's elevated temperature test), and by direct enumeration of E. coli in MacConkey agar, using plastic pounches incubated in a water bath at 44 C. Sime forty strains of E. coli freshly isolated from water, stools, fresh meats and poultry were examined by conventional plating in MacConkey's agar at 37 C and in pouches at 44 C. The results obtained in both series of tests substantiated the validity of the suggested direct enumeration procedure, which combines simplicity, reliability and rapidity. (Little-Battelle)
W74-04768

SPECTROPHOTOMETRIC ESTIMATION OF ARSENIC IN NITRIC ACID EXTRACTS OF SOIL AND SOIL ADDITIVES,
National Vegetable Research Station, Wellsbourne (England).
G. F. Collier.
Journal of the Science of Food and Agriculture, Vol 24, No 9, p 1115-1117, September 1973. 1 tab, 4 ref.

Descriptors: *Spectrophotometry, *Soil analysis, Separation techniques, Nitrites, Soils, Trace elements, Arsenic compounds, Pollutant identification.
Identifiers: *Arsenic, Detection limits, Chemical interference, Recovery, Sample preparation, Accuracy.

The spectrophotometric determination of arsenic in solutions containing nitric acid necessitates the removal of nitrate ions without loss of arsenic. A convenient and effective method for its removal was achieved by treatment with formic acid. The recoveries of arsenic over the working range, 0.4 to 4.0 ppm gave a standard error of 0.039 and 0.052 ppm, respectively. The recoveries obtained by the proposed method of nitrate removal compare favorably with those of the more tedious evapora-

tion procedures where recoveries of 87 percent are reported. It is also a simple and rapid method and permits the detection of arsenic over the normal working range with the minimum of error. (Mortland-Battelle)
W74-04769

ANALYSIS OF TRACE ELEMENTS, PHOSPHORUS AND SULPHUR, IN THE LIPID AND THE NON-LIPID PHASE OF HALIBUT (HIPPOGLOSSUS HIPPOGLOSSUS) AND TUNNY (THUNNUS THYNNUS),
Central Inst. for Industrial Research, Oslo (Norway).
G. Lunde.
Journal of the Science of Food and Agriculture, Vol 24, No 9, p 1029-1038, September 1973. 2 fig, 4 tab, 14 ref.

Descriptors: *Phosphorus, *Sulfur, Fish, *Lipids, Cadmium, Lead, Copper, Zinc, Iron, Mercury, Separation techniques, Neutron activation analysis, X-ray fluorescence, Bromine, *Trace elements, Food chains.
Identifiers: Selenium, Arsenic, *Halibut, *Tunny, Sample preparation, Atomic absorption spectrophotometry.

To study the effect which some natural conditions have upon the level of trace elements, halibut was chosen as representative for a relatively stationary species of fish and old individuals of tunny were selected as examples of non-stationary fish. Samples were homogenized in a blender and extracted with hexane. The insoluble phase (meal) and the aqueous phase were dried, weighed, ashed, the ash dissolved in HCl, and diluted with water. The determination of zinc, iron, selenium, copper, lead, and cadmium in the meal and in the dehydrated aqueous phase was carried out using atomic absorption spectrophotometery and X-ray fluorescence techniques for zinc, cadmium, lead, copper, arsenic, and iron and neutron activation for the analysis of selenium. Mercury was determined together with the selenium in the meal by non-destructive activation analysis. In the aqueous phase the mercury was analyzed in some samples by flameless atomic absorption spectrophotometry. The results show that the tunny which cover a great area and occupy positions near the top of the marine food chain show large variations in the content of the different trace elements analyzed. The halibut samples taken from the various localities did not show such a great difference in the content of trace elements analyzed for. Nor could any particular difference between young and old individuals be observed. The content of the heavy metals lead, copper, zinc and cadmium seems on average to be within the same range as formerly reported. The values for iron found in halibut, are, however, remarkable low. (Morland-Battelle)
W74-04770

A BACTERIOLOGICAL PRESSURE-RETAINING DEEP-SEA SAMPLER AND CULTURE VESSEL,
Woods Hole Oceanographic Institution, Mass.
H. W. Jannasch, C. O. Wirsen, and C. L. Winget.
Deep-Sea Research, Vol 20, No 7, p 661-664, July 1973. 2 fig, 7 ref.

Descriptors: *Marine bacteria, *Sampling, Cultures, Pressure, Incubation, Mixing, Instrumentation, Deep water, Design criteria, Oceans, Mechanical equipment.
Identifiers: *Culturing vessels, *Deep sea sampler.

In order to overcome the decompression problem in bacteriological deep-sea sampling, an instrument was constructed that can be operated both as a sampler and pressurized culture vessel. The 1-liter sample does not undergo a change of pressure during filling at the site of sampling nor during retrieval to the surface and prolonged periods of incubation in the laboratory. Sub-samples of 13 ml may be withdrawn and added without affecting the pressure within the vessel. Means for easy pressure adjustment as well as internal mixing are provided. The sampler was built for operation at pressures of up to 200 atm with a 2 1/2-fold safety margin. It has been successfully tested under internal and external maximum pressure and was used for laboratory experiments. Another instrument to be used for sampling at depths of up to 6000 m is under construction. The sampler consists of two stacked cylinders, each containing a floating piston. It includes three chambers, one of which is divided in two sections by a fixed block containing the adjustable orifice and port for prefilling with sterile distilled water. The sample chamber is lined with non-porous Teflon. The upper end-cap contains the sample inlet valve, the bottom end-cap and a valve for charging the third chamber with air. Six tie-rods clamp the components into a pressure-tight assembly. (Mortland-Battelle)
W74-04773

NUCLEONIC SEDIMENT CONCENTRATION GAUGE - COMPARISON OF TRANSMISSION AND SCATTERING MODES,
Bhabha Atomic Research Centre, Bombay (India), Isotope Div.
For primary bibliographic entry see Field 2J.
W74-04774

APPARATUS FOR RECORDING AVOIDANCE MOVEMENTS OF FISH,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
E. Scherer, and S. Nowak.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1594-1596, October 1973. 3 fig, 3 ref.

Descriptors: *Toxicity, *Bioassay, *Laboratory equipment, *Fish behavior, Movement, Design criteria, Costs, Instrumentation, Water pollution effects, Electronic equipment, Pollutants.
Identifiers: Recorders.

An apparatus for continuously recording movements of fish exposed to chemical substances in a tank consists of an open sight viewer connected to the shaft of a power-supplied potentiometer and mounted so that an observer can track a specimen in the test chamber. The tank is designed with inlets at each end and an outlet in the middle so that a test solution can be precisely added to one end and untreated water at the other end of the tank. The tank is observed through a one-way mirror to reduce visual disturbance of the fish. Varying the position of the viewer changes the output voltage from the potentiometer to a strip chart recorder. The viewer also actuates a voltage sensitive switch which activates a timer when the fish enters one half of the tank and gives a cumulative time of exposure to the conditions in that section. A second timer records overall elapsed test time. Sample recordings show the avoidance response of goldfish when exposed to HgCl2. Total cost of materials to build the system is 1350 dollars, and construction time is about 50 manhours. (Little-Battelle)
W74-04776

USE OF A SILVER-SULFIDE ELECTRODE FOR STANDARDIZING AQUEOUS SULFIDE SOLUTION IN DETERMINING SULFIDE IN WATER,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1589-1591, October 1973. 2 fig, 7 ref.

Descriptors: *Sulfides, *Aqueous solutions, *Water analysis, *Pollutant identification, Methodology, Volumetric analysis, Pollutants, Chemical analysis.
Identifiers: *Silver/sulfide electrodes, Standardization, Potentiometric titration, Endpoints, Iodometric standardization, Ion selective electrodes.

A simplified method is described for standardizing aqueous sulfide solution in determining sulfide in water. A silver-sulfide electrode is used to detect the endpoint in titration of standard solution of sodium sulfide by silver nitrate. The method makes it possible to perform potentiometric titration within 60 sec by adding the titrant until the potential reading is between -150 and 0 mv, without plotting the data on a graph. The concentrations of sulfide solutions determined by this method were within plus or minus 0.24 mg S (SD), or 3 percent, of the values obtained by the conventional iodometric standardization. (Holoman-Battelle)
W74-04777

MERCURY UPTAKE AND ION DISTRIBUTION IN GILLS OF RAINBOW TROUT (SALMO GAIRDNERI): TISSUE SCANS WITH AN ELECTRON MICROPROBE,
Michigan State Univ., East Lansing. Dept. of Physiology.
K. R. Olson, and P. O. Fromm.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1575-1577, October 1973. 4 fig, 7 ref.

Descriptors: *Rainbow trout, *Mercury, *Distribution patterns, Bioassay, Path of pollutants, Heavy metals, Ions, Absorption, Electron microscopy, Freeze drying.
Identifiers: *Gills, *Methylmercury, *Bioaccumulation, Sample preparation, Biological samples, Transport.

Rainbow trout were exposed to 0.25 ppm HgCl2 and 0.05 ppm methylmercury for 23 hr and the gills removed and examined by electron microprobe for the purpose of identifying the pathway of Hg uptake. Gills were prepared by quick freezing, cutting into 4-10-micron sections, mounting on quartz slides or carbon discs, and freeze drying. Mercury was found in gills of rainbow trout which had been exposed to inorganic mercury but not in those exposed to methylmercury. No specific site for mercury uptake was identified and it is suggested that inorganic mercury enters the gill across the general lamellar surface. High concentrations were found associated with the gill cartilage. Since little ion diffusion occurs during tissue preparation, localization and /or identification of tissues can be accomplished by scans for various elements: sodium (Na), potassium (K), Chlorine (Cl), and sulfur (S). The technique is not suitable for identification of highly volatile compounds such as methylmercury due to the necessity of subjecting tissues to high vacuum conditions, however, electron probe analyses should be useful in studies of active ion transport systems in gill tissue and in investigations of the effects of heavy metal pollutants on fishes. (Little-Battelle)
W74-04778

BIOASSAY PROCEDURES TO EVALUATE ACUTE TOXICITY OF NEUTRALIZED BLEACHED KRAFT PULP MILL EFFLUENT TO PACIFIC SALMON,
Fisheries Research Board of Canada, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5C.
W74-04779

EFFECTS OF CADMIUM AND COPPER ON THE OXIDATION OF LACTATE BY RAINBOW TROUT (SALMO GAIRDNERT) GILLS,
Fisheries Research Board of Canada, West Vancouver (British Columbia). Vancouver Lab.
For primary bibliographic entry see Field 5C.
W74-04780

MEASUREMENT OF ADENOSINE TRIPHOSPHATE (ATP) IN TWO PRECAMBRIAN SHIELD LAKES OF NORTHWESTERN ONTARIO,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5B.
W74-04782

DIURNAL VARIATION OF DISSOLVED INORGANIC CARBON AND ITS USE IN ESTIMATING PRIMARY PRODUCTION AND CO2 INVASION IN LAKE 227,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. W. Schindler, and E. J. Fee.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, 1501-1509, October 1973. 10 fig, 9 ref.

Descriptors: *Photosynthesis, Limiting factors, *Carbon, *Primary productivity, Diurnal, *Gas chromatography, Standing crops, *Bioassay, Lakes, Growth rates, Phosphates, Nitrates, Biomass, Phytoplankton, Absorption, Eutrophication, Methodology, Radioactivity techniques, Carbon dioxide, Atmosphere, Nutrients, *Canada.
Identifiers: Errors, Dissolved inorganic carbon.

In the course of studying phytoplankton response to low carbon levels and fertilization with phosphate and nitrate in lake 227 a eutrophic soft-water lake in the Canadian Shield, several paradoxes were observed. Although standing crop increased after fertilization, primary productivity as measured by C-14 uptake at midday remained the same as for unfertilized lakes. Furthermore, although carbon was shown not to limit phytoplankton standing crop, certain observations pointed to carbon limitation of photosynthesis. To attempt to resolve these inconsistencies, a new method was employed based on the diurnal variation of dissolved inorganic carbon (DIC), community respiration, and invasion of CO2 as measured by gas chromatography. Errors were found to result from diurnal variations in the degree of carbon limitation of phytoplankton and from invasion of CO2 from the atmosphere and hypolimnion. Production by phytoplankton in lakes fertilized with nitrogen and phosphorus was found to be several times higher than in natural lakes of the area. Net production during summer stratification was found to equal invasion of CO2 from the atmosphere. The new technique should have application in other eutrophic low carbon lakes, where C-14 tracer techniques are encumbered by serious technical complications. (Little-Battelle)
W74-04784

PRODUCTION OF EPILITHIPHYTON IN TWO LAKES OF THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W74-04787

A SYRINGE GAS-STRIPPING PROCEDURE FOR GAS-CHROMATOGRAPHIC DETERMINATION OF DISSOLVED INORGANIC AND ORGANIC CARBON IN FRESH WATER AND CARBONATES IN SEDIMENTS,
Fisheries Research Board of Canada, Vol 30, No 10, p 1441-1445, October 1973. 2 fig, 1 tab, 9 ref.

Descriptors: *Gas chromatography, Freshwater, Sediments, *Water analysis, Soil analysis, Carbon, Carbamates, Methodology, Chemical analysis, Aquatic soils, Calcite, Dolomite, Nutrients, Nitrilotriacetic acid, Ureas, Calcium carbonate, Canada.
Identifiers: *Dissolved inorganic carbon, Dissolved organic carbon, Syringe gas-stripping method, Sample preparation, Sensitivity, Chemical recovery, Precision, Organic carbon, Lake Winnipeg, Oxalic acid, Tartaric acid, Dextran, Sucrose, Glucose.

A simple, rapid method is described for determining dissolved inorganic carbon in water. A 20-cu cm sample of water is drawn into a 50-cu cm polypropylene syringe and acidified by injection of 1-cu cm of dilute sulphuric acid. Twenty-nine cubic centimeters of helium at atmospheric pressure is injected into the syringe followed by 10 sec of manual agitation to partition CO2 between gas and liquid phase. The gas phase containing 60 percent of CO2 from the sample is then analyzed by gas chromatography. This method has been used to determine dissolved inorganic and organic carbon in Canadian Shield waters and to determine total carbonates in sediments. (Holoman-Battelle)
W74-04788

IDENTIFICATION OF BACTERIA BY COMPUTER: THEORY AND PROGRAMMING,
Central Public Health Lab., London (England). National Collection of Type Cultures.
W. R. Willcox, S. P. Lapage, S. Bascomb, and M. A. Curtis.
Journal of General Microbiology, Vol 77, No 2, p 317-330, August 1973. 1 tab, 28 ref.

Descriptors: *Aerobic bacteria, *Computer programs, *Pollutant identification, Statistical methods, Probability, Laboratory tests, Numerical analysis, Enteric bacteria, Pathogenic bacteria, Methodology.
Identifiers: Bayesian probability.

The methods incorporated in the computer program used in a trial of computer-aided identification of bacteria are described. The identification method is based on Bayes's theorem and allows for dependent tests and missing data in the probability matrix. It was found useful in developing the method to take account of the occurence of errors in bacteriological testing. The method suggests a definite identification only if the Bayesian probability of one of the taxa exceeds a threshold level; if not, a separate procedure selects the best tests to continue the identification. (Mortland-Battelle)
W74-04791

PROBLEM OF ISOLATING SALMONELLA FROM SURFACE WATERS EXEMPLIFIED BY LONG-TERM STUDIES IN THE BERLIN AREA, CAPITAL OF THE GERMAN DEMOCRATIC REPUBLIC, (IN GERMAN),
W. Krueger.
Z Gesamte Hyg Grenzgeb. 18(8): p 590-593. 1972.
Identifiers: *Germany(Berlin area), Human diseases, *Salmonella isolation, Sever discharges, Surface waters, *Public health.

Reliable bacteriological diagnosis is a condition of true epidemiological interpretation of instances of Salmonella isolation from surface waters. Surface water samples (184) taken from various biotopes in the area of Berlin yielded 98 strains of Salmonella of 18 serotypes. The isolation of 10 rare types in a water clearing installation and previous tests indicated that the Salmonella spectrum of surface waters with sewer discharges is an exact reflection of the epidemiological situation among the population and in animal products. Surface waters without discharges from sewers were Salmonella free.--Copyright 1973, Biological Abstracts, Inc.
W74-04835

5B. Sources Of Pollution

BASELINE QUALITY DATA FOR KALIHI STREAM,
Hawaii Univ., Honolulu. Water Resources Research Center.
G. K. Matsushita, and R. H. F. Young.
Available from National Technical Information Service as PB-227 929 $6.50 in paper copy, $1.45 in microfiche. Technical Report No 71, June 1973. 61 p, 40 fig, 11 tab, 35 ref. OWRR A-027-HI(2). 14-31-0001-3811.

Descriptors: *Water quality, Water samples, Density, Drainage, Sampling, Weather, Pesticides, *Hawaii, *Baseline studies, *Land use, *Water quality standards, *Path of pollutants, Coliforms, Domestic wastes, Nutrients.
Identifiers: *Kalihi stream(H.I.).

The purpose was to determine the changes in Kalihi Stream water quality related to variations in land use patterns and to establish some baseline data for assessing the Hawaii State Water Quality Standards for surface waters. Effects on water quality were determined by collecting and analyzing water samples from four sites located along the course of Kalihi Stream between October 1971 to August 1972. The sites were selected within different land use areas along the stream to account for any variation in contribution from undeveloped and developed lands. The stream water quality data for wet and dry weather flows were found to compare favorably with that of other Hawaiian investigators and were in the same order of magnitude as those in the U.S. and other countries. Pollution loads were also calculated on a lbs/acre/day basis and these results compared favorably with results obtained by other U.S. and Hawaiian investigators. The parameter concentrations and pollutional loads were found to increase in a downstream direction as incremental and individual subbasin drainage areas increased in development, land use activity, population density and housing density. Fecal and total coliform densities exceeded Class 2 Standards during dry and wet weather conditions. The nutrient standards for Class A waters were also exceeded during dry and wet weather. There was no significant pesticide contribution to pollution of Kalihi Stream as well results were in the low ppt range.
W74-04309

MIXING PROCESSES,
R. L. Wiegel.
In: Oceanographical Engineering, Chapter 16, p 424-441, 1964. 20 fig, 44 ref. Prentise Hall, New York, NY, Price: $24.75.

Descriptors: Coasts, *Sewage disposal, *Mixing, *Outfall sewers, *Waves(Water), *Currents(Water), *Effluents.
Identifiers: Ocean outfall sewers, Eddy diffusion, Breaking waves, Turbulent flow, Turbulent jets, Wind waves.

Mixing processes are of prime importance to the engineer and to the oceanographer. The transfer of heat down through the surface layers of the ocean is largely due to mixing by eddy diffusion and by large-scale stirring induced by the breaking of waves in a sea. The entrainment of water by currents is due to the mixing of the currents with the boundary waters. The disposal of sewage by coastal towns is usually done by the mixing of the effluent from ocean outfall sewers with the sea water. Some of these mixing processes are described. Explanations are given on the following: mixing of turbulent jets, jet discharging into denser fluid, jet discharging horizontally into denser fluid, jet discharging into fluid with a stable density gradient, horizontal jet as a free surface, eddy diffusion, mixing by wind waves, and mixing by currents. (Sinha-OEIS)
W74-04327

A STUDY OF DIFFUSION IN AN ESTUARY,
Navy Hydrographic Office, Washington, D.C.
W. E. Maloney, and C. H. Cline.
In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, the Engineering Foundation, Vol 2, Chap 29, 536-547, 1961. 10 fig, 1 tab, 5 ref.

Descriptors: *Estuaries, *Pollutants, *Diffusion, *Dispersion, Tidal effects, River flow, Coasts, *Virginia.
Identifiers: Hampton Roads(VA), Flushing, James River(VA), Dilution.

A diffusion-advection method based on a coefficient of eddy diffusivity is used to determine the reduction in concentration and removal of contaminants from estuaries. The discussions are concerned with that portion of a contaminant that goes into solution and partakes of the motion of the waters. A set of empirical dilution factors was computed. The total amount of contaminant released multiplied by the appropriate dilution factor gives the concentration at that time. Two dilution factors are given so that computations may be made either in terms of cubic centimeters or cubic feet. The rapid leveling off of the dilution factors after about 1 tidal cycle assumes that none of the contaminant is advected out of the area. (Sinha-OEIS)
W74-04333

CURRENTS AT HARBOR BEACH, MICHIGAN,
United States Lake Survey, Detroit, Mich.
J. H. Saylor.
Available from NTIS as AD-676 838, for $6.00 paper copy, $1.45 microfiche. Research Report No. 1-3, August 1968. 27 p, 11 fig, 7 ref.

Descriptors: Lakes, *Lake Huron, *Harbors, *Currents(Water), *Water circulation, Winds, *Wind tides, *Thermal pollution, Industrial wastes, Waste disposal, Water pollution, Heated water, Power plants, *Michigan, Path of pollutants.
Identifiers: Flushing, Nearshore, Wind driven currents, Hindcasting.

Currents at Harbor Beach, Michigan were measured using drogue and dye techniques. The measurements showed two patterns of harbor currents depending on the direction of current flow along the shore of Lake Huron. Strong, northerly wind caused southward-flowing currents along the shore of the lake, southward currents along the shore side of the harbor, and good harbor flushing. Wind from directions other than northerly was associated with northward-flowing currents along the shore of the lake and sluggish, northward currents through the harbor. The pattern of northward harbor currents occurred about 75% of the time. It was concluded that the prevailing nearshore currents at this location on Lake Huron are northward. The current patterns show that a power plant recently constructed north of the U.S. Coast Guard Boathouse can expect to recirculate a portion of its own discharge and a portion of the effluent from the Hercules Powder Company (located on the north side on the Company's dock) for the same percentage of time. Turbulence of the power plant discharge will accelerate the vertical mixing of this effluent to all depths. Currents in the vicinity of the new intake and discharge channel will alter patterns locally, but it is not felt that they will change the overall harbor circulation which is driven principally by the nearshore currents in Lake Huron. (Sinha-OEIS)
W74-04342

ENVIRONMENTAL MONITORING AND DISPOSAL OF RADIOACTIVE WASTES FROM U.S. NAVAL NUCLEAR-POWERED SHIPS AND THEIR SUPPORT FACILITIES, 1972,
Department of the Navy, Washington, D.C.
M. E. Miles, and G. L. Sjoblom.
Available from the Supt. of Documents, U.S. Government Printing Office, Washington, D.C. $1.00 per copy. Radiation Data and Reports, Vol 14, No 9, p 517-525, Sept. 1973. 5 tab, 24 ref.

Descriptors: *Nuclear reactors, *Ships, *Radioactive waste disposal, *Harbors, Oceans, Seas, Water pollution, Water pollution sources, Monitoring, Measurement, Assay, Sampling, Toxicity, Public health, Tritium, Cobalt, *United States.

The environmental effect of disposal of radioactive wastes originating from U.S. Naval nuclear propulsion plants and their support facilities is assessed. The total radioactivity discharged to all ports and harbors from the more than 100 nuclear-powered ships and supporting tenders, bases and shipyards was less than 0.002 curie in 1972. Procedures used by the Navy to control releases of radioactivity from U.S. Naval nuclear-powered ships and their support facilities are effective in protecting the environment and the health and safety of the general public. (Houser-ORNL)
W74-04441

A HISTORY AND PRELIMINARY INVENTORY REPORT ON THE KENTUCKY RADIOACTIVE WASTE DISPOSAL SITE,
Kentucky Dept. of Health, Frankfort. Radiological Health Program.
D. T. Clark.
Available from Supt. of Doc., U.S. Print. Off., Washington, D.C., $1.00 per copy. Radiation Data and Reports, Vol 14, No 10, p 573-585, Oct. 1973. 6 fig, 2 tab, 9 append.

Descriptors: *Waste disposal, *Radioactive waste disposal, *Solid wastes, *Liquids, *Kentucky, Nuclear wastes, Assay, Radioisotopes, History, Census, Strontium, Cesium, Tritium, Cobalt, Radium radioisotopes, Permits, Regulation, Data collections, Water pollution, Soil contamination, Public health, Waste storage.
Identifiers: *Waste burial.

The Kentucky radioactive waste disposal site, operated by the Nuclear Engineering Company, Inc., has been in operation since March 1963. As of January 1, 1972, approximately 0.71 million cubic meters of waste, containing 1,153,333 curies of byproduct material, 208,903 grams of special nuclear material, and 39,493 kilograms of source material, have been disposed of at this facility. Due to the relatively long period of operation and the large quantities of radioactive material involved, a detailed inventory of two of the largest pits at the site was made, based on available disposal records. A brief history of this facility and a summary of the inventory results are presented. Detailed data are given for plutonium, cesium, strontium, cobalt, radium, and tritium. (Houser-ORNL)
W74-04442

ECODISTRIBUTION OF PLUTONIUM IN LIQUID WASTE DISPOSAL AREAS AT LOS ALAMOS,
Los Alamos Scientific Lab., N. Mex.
T. E. Hakonson, L. J. Johnson, and W. H. Purtymun.
Available from NTIS, Springfield, Va., as Report No. LA-UR-73-1001. $4.00 per copy, $1.45 microfiche. Report No. LA-UR-73-1001, 1973. 23 p, 3 fig, 3 tab, 9 ref.

Descriptors: *Waste disposal, *Liquid, *Plutonium, *New Mexico, *Ecology, *Ecosystems, *Ecological distribution, Geology, Canyons, Surveys, Assay, Radioactivity, Sediments, Water, Biota.

The nuclear programs at Los Alamos have generated quantities of solid and liquid radioactive wastes. Although the liquid wastes are treated to remove impurities, a small but measurable fraction of the radioactive constituents remain in the effluent. Currently, these effluents are released into two canyons where they eventually disappear into the alluvium. In the past, an additional canyon was used as a liquid waste disposal area, but has not been used since 1964. A survey was initiated in each of these canyons to determine the concentrations of effluent-associated radionuclides in the alluvial sediments, water and some of the native biota. Preliminary findings are summarized on the ecodistribution of Pu-238 and Pu-239 in Mortandad Canyon, an area which has been used for liquid effluent disposal. (Houser-ORNL)
W74-04443

ONE-DIMENSIONAL MODEL OF THE MOVEMENT OF TRACE RADIOACTIVE SOLUTE THROUGH SOIL COLUMNS: THE PERCOL MODEL,
Battelle-Pacific Northwest Labs., Richland, Wash.
R. C. Routson, and R. J. Serne.
Available from NTIS, Springfield, Va., as Report No. BNWL-1718. $5.45 per copy, $1.45 microfiche. Report No. BNWL-1718, 1972. 60 p, 25 fig, 16 tab, 7 ref.

Descriptors: Model studies, *Radioactivity, *Soil chemical properties, *Soil contamination, Soil physical properties, Soil properties, Soil water movement, *Mathematical models, *Path of pollutants.
Identifiers: *Radionuclide movement(Soils).

A one-dimensional mathematical model, PERCOL, has been developed to predict the movement of radionuclides through porous media as a function of measureable chemical parameters of the media. Laboratory column studies were conducted to verify the model. System parameters considered include soil type, radionuclide type, waste composition, flow rate, column length, and soil saturation. The agreement between measured radionuclide movement and that predicted by the model is considered good. (Houser-ORNL)
W74-04444

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE ROBERT EMMETT GINNA NUCLEAR POWER PLANT, ONTARIO, NEW YORK, SEPT. 8, 1970.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W74-04446

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE LA CROSSE BOILING WATER REACTOR, GENOA, WISCONSIN, JULY 1968.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W74-04447

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE VERMONT YANKEE GENERATING STATION AND THE YANKEE NUCLEAR POWER STATION, SEPTEMBER 18, 1970.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W74-04448

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE POINT BEACH NUCLEAR PLANT, TWO CREEKS, WISCONSIN, AUGUST 16 AND 17 1970.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W74-04449

ANNUAL CONSUMPTION OF CESIUM-137 AND COBALT-60 LABELED PINE SEEDS BY SMALL MAMMALS IN AN OAK-HICKORY FOREST,
Oak Ridge National Lab., Tenn.
J. B. Mathies, P. B. Dunaway, G. Schneider, and S. I. Auerbach.
Available from NTIS, Springfield, Va., as Rept No. ORNL-TM-3912. $7.60 per copy, $1.45 microfiche. Report No. ORNL-TM-3912, Dec

1972. 234 p, 33 fig, 62 tab, 166 ref, 3 append. (Ph.D. Thesis, Michigan State University, Lansing).

Descriptors: Mammals, *Rodents, *Absorption, Radioactivity, *Cesium, *Cobalt, *Radioisotopes, Diets, Digestion, Toxicity, Assay, *Forests, Trees, Hickory trees, Oak trees, Seeds, Soils, Vegetation, Seasonal, Ecology, Research and Development, *Tennessee.

Annual and seasonal consumption of eastern white pine seeds was determined radioisotopically in both laboratory and free-ranging populations of small forest mammals within a 2-ha, oak-hickory forest in eastern Tennessee. White-footed mice were chronically-fed Cs-137 and Co-60 labeled pine seeds in the laboratory, and the resultant uptake, equilibrium, and excretion patterns in mice were used to infer food consumption rates. Seed-ingestion rates, of from 2 to 100 seeds per day, were highly correlated with equilibrium levels of Cs-137. Lowering the ambient temperature resulted in lower equilibria, through a range of 21.1C to 4.4C; equilibria in male mice was lower than in females. Free-ranging mice rapidly acquired radioactive body burdens of both isotopes. (Houser-ORNL)
W74-04450

ENVIRONMENTAL SURVEILLANCE FOR FUEL FABRICATION PLANTS,
Battelle Pacific Northwest Labs., Richland, Wash.
J. P. Corley, D. A. Waite, J. W. Johnston, and L. C. Schwendiman.
Available from NTIS, Springfield, Va., as Rept. No. BNWL-1723. $5.45 per copy, $1.45 microfiche. Report No. BNWL-1723, April 1973. 71 p, 1 fig, 2 tab, 70 ref, 4 append.

Descriptors: Surveys, *Monitoring, *Radioactivity, Assay, Air pollution, Water pollution, Soil contamination, *Nuclear powerplants, Nuclear wastes, Fuels, Environment, Sampling, Standards, Regulation, Path of pollutants, Sediments, Vegetation, Biota, Aquatic animals, Fish, Public health.
Identifiers: *Fuel reprocessing, *Surveillance program.

Source material is provided which may be used for: (a) preparation of a regulatory guide concerning environmental surveillance programs for fuel fabrication facilities; (b) evaluation of those portions of environmental statements for fuel fabrication facilities pertaining to proposed environmental surveillance programs. Included is an environmental surveillance program sufficiently general to cover plants fabricating uranium oxide or mixed uranium and plutonium fuels. Program content is not specific to a particular plant. The proposed program provides for surveillance of media believed either to be significant in terms of dose to man or to be potential centers for long-term accumulation of contaminants. To avoid excessive duplication which would result from complete treatments of uranium and mixed oxide plants separately, discussion of the proposed program is presented mainly in terms of plutonium. The program is, however, equally applicable to both uranium and mixed oxide plants, with recognized points of divergence pointed out and discussed. (Houser-ORNL)
W74-04451

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT, JULY-DECEMBER 1972,
Battelle Pacific Northwest Labs., Richland, Wash.
K. L. Kipp, Jr.
Available from NTIS, Springfield, Va., as Rept. No. BNWL-1752. $4.00 per copy, $1.45 microfiche. Report No. BNWL-1752, Aug. 1973. 34p, 3 fig, 9 tab, 4 ref.

Descriptors: *Surveys, Radioactivity, Groundwater, *Radioisotopes, *Tritium, *Nitrates, Measurement, Assay, Regulation, Cobalt radioisotopes, Columbia River, Path of pollutants, Public health, *Washington.
Identifiers: *Ruthenium, Hanford site, Gross beta.

An evaluation of 106-Ru and 3-H concentrations measured near the surface of the unconfined groundwater during the last half of 1972 showed that zones of detectable contamination extended in an easterly to south-easterly direction, as has been observed in the past. Measurable tritium and nitrate ion concentrations were found along the Columbia River. A low groundwater mound showing uranium and nitrate ion continued to be observed in some areas. The few locations were identified for which average groundwater concentrations exceeded the Concentration Guide (CG) of 10 pCi/ml for 106-Ru. Significant concentrations of 106-Ru (over 10% of CG) were found in some areas. Gross beta activity in the groundwater beneath some areas was detectable. (Houser-ORNL)
W74-04452

STRONTIUM-90 AND CESIUM-137 LEVELS IN SOILS OF VARIOUS TYPES AT NIIGATA PREFECTURE, JAPAN,
Niigata Univ. (Japan). Faculty of Agriculture.
K. Kawase, and E. Yokoyama.
Journal of Radiation Research, Vol 14, No 1, p 40-48, March 1973. 2 tab, 17 ref.

Descriptors: *Nuclear explosions, *Radioactivity, *Fallout, *Soil contamination, *Strontium, *Cesium, Measurement, Uptake, Vegetation, Grassland, Forests, Lagoons, Rice, Aquatic soils, Monitoring, Soil leaching, Ion transport, Movement, Depth.
Identifiers: *Japan.

Sr-90 and Cs-137 contents of soils, mostly from radioactive fallouts of past nuclear explosions, were estimated at 15 locations in Niigata Prefecture. Fifteen locations include paddy fields, meadow, grass fields, forest and dried lagoon. Sr-90 contents of the soils, except forest and dried lagoon, ranged from 81 to 315 mCi/km sq. and Cs-137 ranged from 234 to 451 mCi/km sq. These results indicate that the soils except forest and lagoon were highly contaminated with Sr-90 and Cs-137 from radioactive fallouts. The high activities of Sr-90 and Cs-137 were noted in rice paddy fields. Sr-90 of 316 mCi/km sq of Muramatsu Town and Cs-137 of 451 mCi/km sq of Gosen City are probably the highest values recorded in Japan. These high values may reflect the high annual rainfall of these areas. Relatively low Sr-90 and Cs-137 levels of forest soils and dried lagoon suggest that Sr-90 in strongly acidic, sandy and low humic soils were washed away rather easily by water and that Cs-137 in very reductive paddy soil and in volcanic ash soil were also easily removed by water. The distribution of Sr-90 and Cs-137 in relation to various depth of soils indicates that the monitoring of two nuclides in soils should be carried out from the soil sample dug to 50 cm depth. (Houser-ORNL)
W74-04453

TRANS-PACIFIC FALLOUT AND PROTECTIVE COUNTERMEASURES,
Oak Ridge National Lab., Oak Ridge, Tenn.
C. H. Kearny.
Available from NTIS, Springfield, Va., as Report No. ORNL-4900, $4.00 per copy, $1.45 microfiche. Report No. ORNL-4900, Nov. 1973. 25 p, 4 fig, 1 tab, 19 ref.

Descriptors: *Fallout, *Radioactivity, *Meteorology, Movement, *Nuclear explosions, United States, Hazards, Warning systems, Iodine, Milk, Public health, Safety, Air circulation, *Air pollution.
Identifiers: *China.

If a nuclear war in which the United States is not a belligerent is fought in China and if the weapons used produce tropospheric fallout, then the trans-Pacific fallout deposited on the United States may create long-term health hazards that protective counter-measures can do much to lessen. Extrapolations are made from the measured results of lower tropospheric fallout deposited in the United States from four of the first five Chinese tests. It is estimated that if during a war 65 megatons of similar weapons were detonated on or over China so as to produce similar lower tropospheric debris, then in extensive areas of the 50 states much milk would be dangerously contaminated with radioactive iodine. Hazards and expected long-term casualties from eating other fallout-contaminated foods and from exposure to total whole-body gamma doses of 1 to 10 rems from such trans-Pacific fallout in the year following a spasm war are summarized. Also outlined are recommended protective counter-measures and the psychological-political advantages likely to be attained if the President and other high officials were prepared to give all Americans an early, factual account of the approaching trans-Pacific fallout dangers and of the protective countermeasures being taken to minimize casualties and economic losses. (Houser-ORNL)
W74-04454

A RADIOLOGICAL ENVIRONMENTAL SURVEY AT EBR-II,
B. G. Oltman, K. Eckerman, R. Gold, and A. M. Strash.
Report available from NTIS, Springfield, Va., as Report Number ANL-8060, Part II. $10.60 per copy, $1.45 microfiche. In: Report ANL-8060 (Part II), p 278-288, July 1972-June 1973. 4 fig, 3 tab, 6 ref.

Descriptors: *Surveys, Measurement, *On-site data collections, *Idaho, *Radioactivity, Atmospheric pollution, Water pollution, *Soil contamination, Effluent, Nuclear powerplants, Cesium, Lead, Public health, Gamma rays.
Identifiers: Big Lost River(Ida), Plutonium.

Absolute environmental gamma-ray and meson dose rates were determined from measurements made in the vicinity of EBR-II. The detector used for the measurements was a 5-in. diameter sphere of liquid organic scintillator. Fourteen measurements were made at radial distances of up to 5 miles from the EBR-II effluent stack. The average external gamma-ray and meson dose rates determined were 6.0 microrad/hr and 4.5 mircorad/hr, respectively. Soil samples obtained at each of the measurement sites were later analyzed for gamma-ray emitters and for plutonium content. Other than naturally occurring radioactivity, only Cs-137 and Sb-125 seemed to be present in statistically significant amounts. No plutonium deposition pattern can be constructed from the limited number of analyses done. (Houser-ORNL)
W74-04455

ENVIRONMENTAL RADIOACTIVITY,
L. I. Gedeonov.
Issue available from Plenum Pub. Corp., 227W 17th St., New York, N.Y. $15.00 per copy. Soviet Atomic Energy Agency, Vol 33, No 2, Aug. 1972, p 760-765, Feb. 1973. Trans. from Atomnaya Energiya.

Descriptors: Environment, Research and development, Ecology, *Air pollution, Water pollution, *Water pollution sources, Soil contamination, *Radioactivity, *Monitoring, Nuclear powerplants, Nuclear wastes, Mathematical studies, Geochemistry, Geophysics, Radiochemical analysis, Public health.

Studies of radioactive contamination of various media in the biosphere carried out at the Radium Institute over many years have made it possible to develop methods of investigation which are widely applicable at the present time. A large amount of data has been accumulated on the distribution of

radioactive contaminants in space and on the variation of their concentration in time. Certain relationships have been described mathematically; their interpretation was based on geophysical and geochemical factors. One can hope for future discovery and determination of the actual mechanism responsible for the observed relationships. It would then appear to be possible to evaluate the presumed radiation hazard from contamination of the seas and oceans. The capability of observing artificial and natural radioactive tracers now existing in nature should be used as an instrument for studying geophysical and geochemical processes. (Houser-ORNL)
W74-04456

PHOSPHORUS RELATIONSHIPS IN RUNOFF FROM FERTILIZED SOILS,
Agricultural Research Service, Lafayette, Ind.
M. J. M. Romkens, and D. W. Nelson.
Journal of Environmental Quality, Vol 3, No 1, p 10-13, January-March 1974. 4 fig, 2 tab, 14 ref.

Descriptors: *Water pollution sources, *Phosphorus, *Fertilizers, *Phosphates, *Soil water movement, Erosion, Sediments, Path of pollutants.

The effect of fertilizer mixed into soil on the amount of phosphorus in runoff was studied. Runoff samples from artificial rainstorms on fallow plots of Russell sil soil, and P enriched soil-water mixtures (1:50) of Russell sil and other soils were analyzed for water soluble orthosphosphate and extractable, total, and organic P in sediment. The relation of P addition rate to the soluble orthosphosphate or sediment extractable phosphorus level in runoff was approximately linear. The relation of soluble orthophosphate to extractable P in soil-water systems was linear for most soils studied. Soluble orthosphosphate and extractable P in sediment were not related to total P or to organic P in sediment. A procedure is suggested for estimating the soluble orthophosphate concentration in runoff from fertilized wet soil using laboratory analyses. (Knapp-USGS)
W74-04471

NUTRIENTS IN SUBSURFACE AND RUNOFF WATERS OF THE HOLLAND MARSH, ONTARIO,
Ministry of the Environment, Rexdale (Ontario). Water Quality Branch.
K. H. Nicholls, and H. R. MacCrimmon.
Journal of Environmental Quality, Vol 3, No 1, p 31-35, January-March 1974. 3 fig, 2 tab, 18 ref.

Descriptors: *Nutrients, *Path of pollutants, Water pollution sources, *Marshes, Soils, *Canada, *Fertilizers, *Nitrogen, *Phosphorus, Nitrates, Nitrites, Runoff.
Identifiers: Holland Marsh(Ont).

Relative contributions to the river of nutrients (NO3, NO2, and total and soluble reactive phosphorus) and total electrolyte (specific conductance) were determined in surface runoff water pumped from both cultivated and uncultivated plots of muck soil within the Holland Marsh, Ontario. In addition, subsurface water from piezometers installed in both cultivated and uncultivated marsh soil was analyzed throughout the growing season to determine fundamental differences in water chemistry and the extent of leaching of N and P under both cultivated and uncultivated conditions. The time and amount of rainfall are important in determining nitrate-N and to a lesser extent, soluble reactive P concentrations in subsurface water beneath the cultivated plot but not beneath the uncultivated plot. The mean concentration (0.75 mg/liter) of inorganic N in subsurface water under the cultivated plot was about 10 times higher than under uncultivated marsh during the growing season. The combined effects of fertilization, drainage and hence oxidizing and nitrifying conditions yielded 4 to 5 times more P (1.56 kg P/ha) and 40 to 50 times more nitrate-N (4.1 kg N/ha) in runoff water from the cultivated than from the uncultivated plot. From the cultivated plot the nutrients are lost to the river during a 5 to 6 week pumping period during the spring and more than 90% of the total P in runoff is in the soluble reactive form (as opposed to only 45% from the uncultivated marsh) and is, therefore, readily available for algae and aquatic plant growth in the lower Holland River and Cook Bay of Lake Simcoe. (Knapp-USGS)
W74-04478

QUANTITY AND CHEMICAL QUALITY OF LOW FLOW IN THE EAST FORK SAN JACINTO AND WEST FORK SAN JACINTO RIVERS NEAR HOUSTON, TEXAS, JUNE 24, 26, 1969,
Geological Survey, Austin, Tex.
J. C. Fisher, and G. Ramos.
Open-file report, December 1973. 21 p, 3 fig, 6 tab, 5 ref.

Descriptors: *Water quality, *Low flow, *Texas, Streamflow, *Hydrologic data, Data collections, Chlorides, Water chemistry.
Identifiers: *San Jacinto River(Tex).

Low-flow data were collected June 24, 1969, on an 18.0-mile reach extending downstream from the gaging station East Fork San Jacinto River near Cleveland, Texas. On June 24, and 26, low-flow data were collected on a 37.3-mile reach extending downstream on the West Fork San Jacinto River from 0.7 mile below the proposed Lake Conroe dam site. Changes in chemical quality of water in the East Fork San Jacinto were minor. Water discharged into Lake Houston contained 153 mg/liter dissolved solids and 54 mg/liter chloride. Flow in the East Fork San Jacinto River increased from 16.0 cfs to 21.2 cfs in the study reach. Discharge measurements indicate a losing reach in the upper 3.7 miles and a gaining reach in the remaining 14.3 miles. Changes in chemical quality of water in the West Fork San Jacinto were minor. Water discharged into Lake Houston contained 242 mg/liter dissolved solids and 80 mg/liter chloride. Flow in the West Fork San Jacinto increased from 2.03 to 36.5 cfs in the study reach. Discharge measurements indicate three losing and six gaining subreaches. (Knapp-USGS)
W74-04481

RELATIVE SUSCEPTIBILITY OF LAKES TO WATER-QUALITY DEGRADATION IN THE SOUTHERN HOOD CANAL AREA, WASHINGTON,
Geological Survey, Tacoma, Wash.
G. C. Bortleson, and B. L. Foxworthy.
Open-file report, 1973. 11 p, 1 fig, 1 plate, 9 ref.

Descriptors: *Lakes, *Water pollution sources, *Washington, Land use, Septic tanks, Path of pollutants, Water pollution effects, Limnology, *Biodegradation, Chemical degradation.
Identifiers: Hood Canal area(Wash).

Techniques were devised to allow a rapid assessment of conditions pertaining to water quality in the lakes in the southern Hood Canal area of Washington. The main objective of this study was to evaluate lakes in the area as to their relative susceptibility to water-quality degradation from natural and man-related causes. Under natural conditions the lakes were surrounded by conifer forests; most are still bordered by woodlands, some of which are in a period of regrowth after timber harvesting. All the lakes studied that have a surface area greater than 20 acres and about one-half the smaller lakes have surface-water outlets at least during periods of high water. Man has accelerated the natural lake aging principally through increased sedimentation, resulting from logging and construction in the lake's drainage area, and enrichment of the water with nutrient substances, such as compounds of nitrogen and phosphorous. Soil and rock materials in the lake drainage basin are a major control on the chemical character of lake water under natural (undeveloped) conditions. Lake depth is the most significant physical feature affecting the ability of a lake to produce and assimilate nutrients. Because virtually all domestic wastes are dispersed through septic-tank systems, groundwater contaminated with septic-tank effluent has become a principal source of nutrients for lakes with populated shorelands. (Knapp-USGS)
W74-04488

APPLICATION OF THE CONCEPT OF RECTILINEAR VORTICES TO THE MOVEMENT OF OIL SLICKS,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
T. S. Murty, and M. L. Khandekar.
Manuscript Report Series No 32, 1973. 26 p, 6 fig, 2 tab, 10 ref.

Descriptors: *Oil spills, *Path of pollutants, *Numerical analysis, *Vortices, Mathematical models, Currents(Water), Winds, *Canada.

The concept of rectilinear vortices was applied to study the movement of oil slicks in general, particularly in the Strait of Georgia, British Columbia. The formulation of the problem under this concept led to a set of ordinary first order differential equations which were solved using Hamming's modified predictor-correction method. Although numerical models alone cannot predict the detailed movement of oil slicks, at least they can be used to assess some gross features of the motion. The concept of rectilinear vortices is useful in computing the horizontal trajectories of individual slicks. If the current is small, then the mutual interactions of the slicks are very important in determining the trajectories. (Knapp-USGS)
W74-04490

A PROPOSAL FOR THE INVESTIGATION OF POSSIBLE GROUND-WATER CONTAMINATION IN THE BANGOR AREA, KITSAP COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash.
N. P. Dion.
Open-file report, 1974. 24 p, 1 fig, 3 tab, 10 ref.

Descriptors: *Water pollution sources, *Path of pollutants, *Groundwater movement, *Explosives, Malenclaves, Pit recharge, Waste water disposal, Hydrogeology.
Identifiers: *TNT, *RDX(Cyclonite).

From 1966 to 1970 as a result of steam cleaning of explosive projectiles, explosive wastes were disposed through groundwater recharge. The Navy estimates that between 1966 and 1970 about 50,000 pounds of the explosives TNT (trinitrotoluene) and RDX (cyclonite) were routed to a shallow unlined pit in the ground. Because the disposal pit is in a recharge area of an aquifer used for domestic water supplies, and explosives residues in water may be poisonous, the Navy became concerned with the environmental consequences of the disposal practice. The Geological Survey's proposal for the investigation is described. In Phase I, the initial step covered by this report, the Geological Survey (1) drafts a statement of the problem, (2) defines the scope of the entire study (including Phases II and III), (3) specifies the expected study output, and (4) provides an estimate of the time and costs involved. (Knapp-USGS)
W74-04491

ENVIRONMENTAL CHEMISTRY: AIR AND WATER POLLUTION,
Weber State Coll., Ogden, Utah. Dept. of Chemistry.
H. S. Stoker, and S. L. Seager.
Scott, Foresman and Co., Glenview, Illinois (and London, England). 1972. 186 p.

Descriptors: *Engineering education, *Water pollution, *Air pollution, *Waste water treatment, Water pollution sources, Pollutant identification, Pollution abatement, Mercury, Detergents, Pesticides, Oil spills, Temperature, Meteorology, Thermocline.

This introductory text on the chemistry of water and air pollutants comprises 14 chapters, each with further reading references. They are devoted to the general aspects of pollution (sources, types, and measurement); specific pollutants (such as mercury, detergents, pesticides, oil spills, etc.); temperature inversions (greenhouse effect); and waste water treatment. (Brown-IPC)
W74-04513

BIOCHEMICAL ECOLOGY OF WATER POLLUTION,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W74-04523

CHARACTERISTICS OF PULP AND PAPER MILL WASTES AND ISI STANDARDS,
Central Public Health Engineering Research Inst., Nagpur (India).
P. V. R. Subrahmanyam, R. C. Parekh, and G. J. Mohanrao.
IPPTA (Journal of the Indian Pulp and Paper Technical Association), Vol 9, No 1, p 31-39, January-March 1972. 10 tab, 17 ref.

Descriptors: *Pulp and paper industry, *Water pollution sources, Discharge(Water), *Pulp wastes, Effluents, Biochemical oxygen demand, Suspended solids, Water consumption(Except consumptive use), *Mercury, Pollutants, Monitoring, *Water quality standards.
Identifiers: *India.

The growth of the Indian pulp, paper, strawboard, and newsprint industry during the past two decades was accompanied by increased volumes of discharged effluents. Depending on water conservation measures practiced by various mills, effluent discharges may vary considerably. In a well operated integrated pulp and paper mill, they may amount to 227 to 272 cu m per ton of paper made and contain 34.5 kg of BOD and 87.7 kg of suspended solids. Effluents from straw pulp and board mills contain ca. 79.5 kg BOD and 224 kg suspended solids per ton of product. Newsprint mill discharges average 50.3 kg BOD and 83.3 kg solids per ton. Assuming an average discharge of 50,000 gal per ton of product for all kinds of paper, the resulting daily discharge of ca. 87 million gal would be equivalent to the sewage output of a population of 3 million people. Pollution tolerance limits for several industrial effluents are tabulated. The most important, because most toxic, pollutant to be monitored in mill effluents is mercury. (Wise-IPC)
W74-04530

WATER POLLUTION IN THE NETHERLANDS,
Instituut voor Grafische Techniek TNO, Amsterdam (Netherlands).
J. F. Monroy.
In: Proceedings of IARIGAI (International Association of Research Institute of the Graphic Arts Industries) Symposium on Environmental Control Problems, Stockholm, Sweden, September 25-26, 1972. Grafiska Forskningslaboratoriet, Stockholm, p 23-31 (1972), 1 tab.

Descriptors: *Water pollution sources, *Industrial wastes, *Chemical industry, Europe, Photography, Solvents, Pigments, Binders, Regulation, Pollution abatement, Waste water treatment, Effluents, Costs.
Identifiers: *Netherlands, Graphic arts, *Printing industry, Silver compounds, *Inks.

Sources of water pollutants in the Dutch graphic arts industries include photoengraving, lithographic platemaking, gravure printing, silve-based photography, and other processes and operations. Ink components contributing to pollution include pigments, binders, and solvents. Technological problems, costs, planning, and regulatory control of effluent treatment and discharge in the Netherlands are outlined. (Brown-IPC)
W74-04536

A PRELIMINARY SURVEY OF THE POSSIBLE CONTAMINATION OF LAKE NAKURU IN KENYA WITH SOME METALS AND CHLORINATED HYDROCARBON PESTICIDES,
Utrecht Rijksuniversiteit (Netherlands). Inst. of Veterinary Pharmacology and Biological Toxicology.
For primary bibliographic entry see Field 5C.
W74-04547

REVIEWING ENVIRONMENTAL IMPACT STATEMENTS-POWER PLANT COOLING SYSTEMS, ENGINEERING ASPECTS,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5G.
W74-04555

SOME NEGLECTED SOURCES OF WATER POLLUTION (NEDOSTATOCHNO UCHITYVAYEMYYE ISTOCHNIKI ZAGRYAZNENIYA PRIRODNYKH VOD),
A. I. L'vovich.
Vodnyye Resursy, No 3, p 125-130, 1973. 3 tab, 10 ref.

Descriptors: *Water pollution sources, Water pollution, Waste water(Pollution), *Farm wastes, *Pesticide residues, *Fertilizers, *Industrial wastes, *Mine water, Sediments.
Identifiers: *USSR.

Water pollution sources generally disregarded, or inadequately treated in the literature on water pollution control, are examined. These sources include: (1) conditionally clean waters of industrial enterprises; (2) mine waters; (3) surface runoff from populated and industrialized areas and from croplands treated with pesticides and mineral and organic fertilizers; (4) farm wastes; and (5) sediments carried off from eroded lands. Rational and efficient use of water resources and their protection from contamination can be realized only through broad implementation of water conservation measures actively supported by water users themselves. (Josefson-USGS)
W74-04579

HYDROGEOLOGIC CONSIDERATIONS IN SOLID WASTE STORAGE IN IOWA: PART 1. SANITARY LANDFILL SITE SELECTION: PART 2. A METHOD OF HAZARDOUS AND TOXIC WASTE DISPOSAL,
Geological Survey, Iowa City, Iowa.
For primary bibliographic entry see Field 5E.
W74-04592

EFFECTS OF BACKPUMPING FROM SOUTH NEW RIVER CANAL AT PUMP STATION S-9 ON QUALITY OF WATER IN WATER-CONSERVATION AREA 3, BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
H. J. Freiberger.
Open-file report 73026, 1973. 64 p, 23 fig, 3 tab, 6 ref.

Descriptors: *Water quality, *Canals, *Florida, *Dissolved oxygen, Water conservation, Water management(Applied), Water pollution sources, Path of pollutants, Water quality control, Hydrologic data, Pumping, Water levels, Flow control, Flood control, Water analysis, Chemical analysis, Biochemistry, Trace elements.
Identifiers: Broward County(Fla), *Backpumping, *Ammonia nitrogen.

The quality of water in Water-Conservation Area 3 (Broward County, Florida) is affected by backpumping from the South New River Canal at pump station S-9, as indicated by marked decreases in dissolved oxygen and increases in ammonia nitrogen in the canals of the conservation area. Decreases in dissolved oxygen immediately above S-9 of as much as 5.8 mg/liter were recorded after backpumping and effects in the canals of the conservation area were detected as far as 3 miles from S-9. Increases in ammonia immediately above S-9 of as much as 01.26 mg/liter were recorded after backpumping. The low dissolved oxygen, as low as 0.20 mg/liter, and the high ammonia, an average of 0.38 mg/liter (NH3-N), in South New River Canal below S-9 result from the large groundwater contribution that occurs with backpumping. The areal extent and period of degradation in Water-Conservation Area 3 from backpumping is dependent mainly on the amount of flow released from Water-Conservation Area 2, which dilutes and flushes backpumped water. Concentrations of potential contaminants including toxic metals, pesticides, and nutrients, especially phosphorus, are relatively low in the area of South New River Canal affected by backpumping. (Woodard-USGS)
W74-04600

HYDROLOGIC AND GEOLOGIC CONSIDERATIONS FOR SOLID-WASTE DISPOSAL IN WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5E.
W74-04605

WATER QUALITY RECORDS FOR THE HUBBARD CREEK WATERSHED, TEXAS, OCTOBER 1969-SEPTEMBER 1972,
Geological Survey, Austin, Tex.
H. J. Davidson.
Open-file report (Texas District), 1973. 81 p, 2 fig, 13 tab.

Descriptors: *Water quality, *Reservoirs, *Texas, *Data collections, *Hydrologic data, Sampling, Chemical analysis, *Electrical conductance.
Identifiers: Hubbard Creek watershed(Tex).

Since February 1962, a network of daily chemical-quality and streamflow stations has been operated in the Hubbard Creek watershed, Texas. Daily specific conductance is measured and selected samples are chosen for chemical analysis depending on the amount of flow at the time of sampling. A compilation is presented of the records for the period October 1969 to September 1972. Periodic surveys of Hubbard Creek Reservoir are made to study salinity stratification. (Knapp-USGS)
W74-04606

HYDRAULIC MODEL EXPERIMENT ON THE DUFFUSION DUE TO THE COASTAL CURRENT,
Kyoto Univ. (Japan). Disaster; Prevention Research Inst.
H. Higuchi, and Y. Iwagaki.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 2, Part 4, Chap 87, p 1357-1376, 1969. 13 fig, 3 tab, 3 ref.

Descriptors: *Harbors, Tidal effects, *Currents(Water), Density, Circulation, Waste disposal, Water pollution sources, Diffusion, Coasts, *Hydraulic models, *Path of pollutants.
Identifiers: *Japan(Kashima Harbor), *Longshore currents, *Tidal currents.

The diffusion phenomena due to the tidal current and the longshore current inside and outside a harbor are studied in a hydraulic model experiment, for which the Kashima Harbor area is used as the prototype. The tidal current, the longshore current and the effect of density are taken into account, but the direct effects of wind and waves are not considered. A model of Kashima Harbor was constructed, and a semidiurnal tide generated by an automatically controlled pneumatic tide generator and longshore current by a water circulating system were provided for it. The water level at 4 stations and current pattern were measured. The diffusion of dyed water from instantaneous point sources and a continuous point source was investigated by the photographic method and dye concentration analysis. (Sinha-OEIS)
W74-04628

BUOYANCY SPREAD OF WASTE WATER IN COASTAL REGIONS,
Vattenbyggnadsbyran Ltd., Stockholm (Sweden).
I. Larsen, and T. Sorensen.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 2, Part 4, Chap 89, p 1397-1402, 1969. 3 fig, 3 ref.

Descriptors: Waste water(Pollution), Density, *Buoyancy, Water pollution sources, Winds, *Heated water, Turbulence, Diffusion, *Waste dilution, Sewage, *Outfall sewers, *Path of pollutants.

Waste water may, due to buoyancy effects, spread horizontally on top of the recipient. The spreading is chiefly determined by the buoyancy flux and to a large extent is unaffected by dilution and diffusion. This phenomenon is of great practical importance for larger outfalls of waste or cooling water in coastal regions. The theory presented takes into account the vertical turbulent diffusion and shows that the spreading of waste water due to density differences is determined chiefly by the buoyancy flux and to a large extent is unaffected by dilution and diffusion. The theory may be expected to give results of the correct order of magnitude. Calculations for outfalls from larger cities will show that the places normally considered sheltered from the outfall zone by a region of considerable turbulent diffusion may in some cases by polluted by poorly diluted waste water. The influence of wind may add significantly to this effect. (Sinha-OEIS)
W74-04630

THE USE OF COMPUTER SIMULATIONS FOR SYSTEMS ECOLOGICAL STUDIES IN THE BALTIC,
Stockholm Univ. (Sweden). Asko Lab.
S. Sjoberg, F. Wulff, and P. Wahlstrom.
Ambio. Vol 1, No 6, p 217-222. 1972, Illus.
Identifiers: *Baltic Sea, Computer models, Ecological studies, Flow, Model studies, *Oxygen, *Phosphorus, *Simulation analysis, Systems analysis.

A model describing the P and O2 flows of the Baltic is presented. Different perturbations of these flows were simulated on a computer, and the results are discussed. The aim of the model is to get a better understanding of which processes are the most critical for the behavior of the Baltic as a whole. The release of phosphate from reduced sediments and the water exchange with the Kattegatt were vital features of the simulated system.--Copyright 1973, Biological Abstracts, Inc.
W74-04634

THE RELATION BETWEEN PHYTOPLANKTON AND PHOSPHATE IN THE LAKE OF CONSTANCE, (IN GERMAN),
Staatliches Institut fuer Seenforschung und Seenbewirtschaftung, Konstanz (West Germany). Abteilung Max Auerbach-Institut.
For primary bibliographic entry see Field 5C.
W74-04637

URBANIZATION: A HYDROLOGICAL HEADACHE,
Lund Inst. of Tech. (Sweden).
For primary bibliographic entry see Field 4C.
W74-04642

POLLUTED SNOW IN SOUTHERN NORWAY DURING THE WINTERS 1968-1971,
Oslo Univ. (Norway). Zoological Lab.
K. Elgmork, A. Hagen, and A. Langeland.
Environ Pollut. Vol 4, No 1, p 41-52. 1973. Illus.
Identifiers: Acid, Heavy metals, *Lead, *Norway, Pressure, *Snow, *Sulfur, Winters, *Air pollution, Water pollution sources.

In recent yrs, the snow in southern Norway was laminated with conspicuous grey bands which were considerably more acid, had a higher electrical conductivity and larger amounts of S, heavy metals and other elements than the white layers of the snow. These bands indicate a considerable airborne pollution with values of S up to 8.5 mg/l and of Pb up to 98 microgram/liter, and with pH values down to 3.25 in the melt water. The chemical stratification in the snow was preserved throughout the winter in areas with a cold climate. A regional study of the snow in late winter may thus give information of the distribution of airborne pollution. The acidity and contents of chemical substances in the snow was too high and found over too wide an area to be produced in Norway. The pollution was probably brought in by low pressure systems from the great industrial and urban areas in western and central Europe.--Copyright 1973, Biological Abstracts, Inc.
W74-04652

ZONE OF FLOW ESTABLISHMENT FOR ROUND BUOYANT JETS,
Oak Ridge National Lab., Tenn.
E. Hirst.
Water Resources Research, Vol 8, No 5, p 1236-1246, October 1972. 12 fig, 20 ref.

Descriptors: *Jets, *Buoyancy, *Mixing, *Effluent streams, Density, Flow, Diffusion, Heated water, Temperature, Thermal powerplants, Water temperature, Hydraulics, *Thermal pollution, Water pollution, Mathematical models, Entrainment, Jets.
Identifiers: *Zone of flow establishment, Diffusers.

A method is developed to predict physical properties within the zone of flow establishment (ZFE) for thermal effluents discharged as buoyant jets through round submerged diffuses. The ZFE is the region immediately beyond the diffuser exit in which the mean flow profiles undergo a transition from their internal flow shapes to a free turbulent flow condition. The integral equations of mass, energy, and momentum conservation are used. The solution includes the length of the ZFE and the values of jet width, jet orientation, and center line temperature throughout this zone. The method can predict buoyant jets with three-dimensional trajectories discharged to flowing stratified ambients. Results obtained with the method agree well with the limited experimental data available and with existing empirical correlations. These results provide the necessary initial conditions for conventional (applicable only in the zone of established flow) jet predictions methods; and thus the accuracy of hydrothermal predictions of thermal effluents from power plants will be improved. (Oleszkiewicz-Vanderbilt)
W74-04657

DETAILED TIME VARIATIONS IN MEAN TEMPERATURE AND HEAT CONTENT OF SOME MADISON LAKES,
State Univ. of New York, Buffalo. Dept. of Biology.
For primary bibliographic entry see Field 2H.
W74-04659

ON THE STABILITY OF LAMINAR PLUMES: SOME NUMERICAL SOLUTIONS AND EXPERIMENTS,
Cornell Univ., Ithaca, N.Y. Dept. of Mechanical Engineering.
L. Pera, and B. Gebhart.
International Journal of Heat and Mass Transfer, Vol 14, No 7, p 975-984, 1971, 6 fig, 10 ref.

Descriptors: *Laminar flow, *Jets, *Stability, *Buoyancy, Fluid mechanics, Heat transfer, Mass transfer, Flow, Turbulence, Stratification, Thermal properties, Temperature, Stream flow, Numerical analysis, Model studies, Boundary layers, Viscosity.
Identifiers: *Inviscid instability, *Laminar plumes.

An investigation of the hydrodynamic stability of a laminar plume arising from a horizontal line source of heat was carried out using the Tollmien-Schlichting theory of small disturbances. Inviscid solutions of the Orr-Sommerfeld equation were obtained for both symmetric and asymmetric disturbances and the effect of the Prandtl number on the inviscid stability was calculated for asymmetric disturbances. The base flow was found to be less stable for the asymmetric mode. In addition, the full disturbance momentum equations, coupled and uncoupled from the energy equation, were numerically integrated with the boundary conditions appropriate for asymmetric disturbances superimposed on the symmetric plume base flow. Neutral stability curves have been obtained in terms of the Grashof number. The predominance of the assumed asymmetric mode of flow oscillation was verified experimentally by perturbing a plume, in air, with a vibrating ribbon. The experimental results demonstrate that sufficiently high frequency disturbances are stable as they are convected downstream. (Jerome-Vanderbilt)
W74-04662

THE THERMAL REGIME OF LAKE LANAO (PHILIPPINES) AND ITS THEORETICAL IMPLICATIONS FOR TROPICAL LAKES,
Indiana Univ., Bloomington. Dept. of Zoology.
For primary bibliographic entry see Field 2H.
W74-04665

ANALYTICAL METHODS OF SOLUTION OF CONJUGATED PROBLEMS IN CONVECTIVE HEAT TRANSFER,
Akademiya Navuk BSSR, Minsk. Inst. of Heat and Mass Transfer.
For primary bibliographic entry see Field 8B.
W74-04667

HEAT - A GROWING WATER POLLUTION PROBLEM,
S. C. Bloom.
Environmental Reporter, Vol 1, No 1, Monograph 4, p 1-21, May 1, 1970. 4 tab.

Descriptors: *Thermal pollution, *Cooling water, *Thermal powerplants, *Reviews, Cooling, Resources, Water resources, Water pollution sources, Electric power production, Aquatic environment, Aquatic life, Legislation, Biological community, Water temperature, Fish, Standards, Administration, Research and development, Mixing, Stratification, Dispersion, Climates.
Identifiers: *Thermal discharges.

Thermal pollution has become a matter of growing conern as the industrial demand for water for cooling and condensing has increased. Electric power production accounts for more than four-fifths of total cooling water use and nearly one-third of all water use. Temperature affects nearly every physical property of concern in water quality management including density, viscosity, vapor pressure, surface tension, gas solubility, and gas diffusion. The reduction in the solubility of oxygen is probably the most important of these effects, as an adequate supply of dissolved oxygen is essential in biological degradation of organic matter in an aerobic environment. While extreme temperatures are lethal to many organisms, moderately raised temperatures may affect the metabolic rates, growth, reproduction and distribution of many aquatic species. Recorded fish kills and other adverse effects due to thermal pollution are discussed. Various federal and state regulatory agencies and codes are generally organized around the amount of temperature increase allowed and the size of the heated-water mixing zone. Limiting temperature criteria in water quality standards for interstate waters are presented. Present research programs are reviewed and alternatives to heat discharge are considered. (Jerome-Vanderbilt)
W74-04668

SPECTRA OF THE TEMPERATURE AND HUMIDITY FLUCTUATIONS AND OF THE FLUXES OF MOISTURE AND SENSIBLE HEAT IN THE MARINE BOUNDARY LAYER,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 2E.
W74-04672

THE APPLICATION OF NUMERICAL SIMULATION MODELS IN THE ASSESSMENT OF THE EFFECT OF DISCHARGES INTO COASTAL WATERS,
RAND Corp., Santa Monica, Calif.
E. C. Gritton.
Rand Paper No 4948, January 1973. 3 p, 5 ref.

Descriptors: *Discharge(Water), *Mathematical models, *Water quality, *Finite element analysis, Computer models, Thermal powerplants, Nuclear powerplants, Momentum equation, Continuity equation, Cooling water, Temperature, Water pollution, Water temperature, Estuaries, Sea water, Numerical analysis, *Simulation analysis.
Identifiers: Rand water quality model, Coastal seas.

A water quality simulation model was developed for use in well-mixed estuaries and coastal seas. The model is based on the numerical solution by finite difference techniques of the two-dimensional vertically integrated equations of motion and continuity for a fluid. The use of this model is suggested to determine how the discharges from an offshore or coastal nuclear plant would affect the ecology of the receiving waters. These effects consist mainly of an increase in temperature and addition of materials to the water during its passage through the plant for cooling purposes. A model of this type can supply the quantitative information if sufficient field data are available. (Oleszkiewicz-Vanderbilt)
W74-04674

PRINCIPLES OF EVALUATING EFFECTS OF THERMAL DISCHARGES ON SURFACE WATERS (GRUNDLAGEN FUR DIE BEURTEILUNG DER WARMEBELASTUNGEN VON GEWASSERN).
Landerarbeitsgemeinschaft Wasser, Mainz (West Germany).
For primary bibliographic entry see Field 5C.
W74-04764

HYDROCARBON AND CHLOROPHYLL: A CORRELATION IN THE UPWELLING REGION OFF WEST AFRICA,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
A. Zsolnay.
Deep-Sea Research, Vol 20, No 10, p 923-925, October 1973. 1 fig, 8 ref.

Descriptors: *Organic compounds, *Chlorophyll, *Phytoplankton, *Sea water, Separation techniques, Upwelling, Analytical techniques, Euphotic zone, Sampling, Statistical methods, Data processing, Adsorption, Water pollution sources, *Atlantic Ocean.
Identifiers: *Data interpretation, Sample preparation.

Seawater samples were taken from 17 stations off West Africa for analysis of hydrocarbon and chlorophyll a content to investigate their possible relationship. Samples were taken in the euphotic zone, usually at 4, 10, 17 and 35 m. The hydrocarbons were extracted from the sea water by shaking each of two 1-litre aliquots of the sample with 10 ml hexane. The extracts were combined and concentrated under vacuum until their volume was 300 microliters. Fifty microliters were then injected on a 10 cm column with a 1.8 mm i.d. containing 0.05-0.2 mm silica gel that had been 5 percent (w/w) deactivated with distilled water. The heat of adsorption detector consisted of two thermistors, one surrounded by an inert material while the other was packed in a material capable of adsorbing hydrocarbons. The resulting heat of adsorption was than a measure of the amount of hydrocarbons present and resulted in one sharp peak within two minutes after injection. Amounts as small as 1 microgram hydrocarbon could be determined with fresh graphite as the adsorbent. A significant linear correlation between the non-aromatic hydrocarbons and the chlorophyll-a content in the euphotic zone of the water off West Africa existed between 4 March and 10 March 1972. This showed that the hydrocarbons present were the result of phytoplankton activity. The line of the estimating equation tended to go through the origin, indicating that the hydrocarbons in the euphotic zone were not due to a pollution source. (Mortland-Battelle)
W74-04771

LABORATORY STUDIES OF THE ACCOMMODATION OF SOME CRUDE AND RESIDUAL FUEL OILS IN SEA WATER,
Bedford Inst., Dartmouth (Nova Scotia).
D. C. Gordon, Jr., P. D. Keizer, and N. J. Prouse.
Journal of the Fisheries Research Board of Canada, Vol 30, No 11, p 1611-1618, November 1973. 5 fig, 6 tab, 11 ref.

Descriptors: *Laboratory tests, *Sea water, *Oil pollution, *Oil wastes, Turbulence, Water temperature, Chemical analysis, Gas chromatography, Oil spills, Organic compounds, Water pollution sources.
Identifiers: Crude oil, Residual fuel oil, Accomodation, *Fate of pollutants, Particulate oil, Subparticulate oil, Aliphatic hydrocarbons, Petroleum hydrocarbons, Flame ionization gas chromatography, Fuel oil, Fluorescence spectrophotometry, Gas liquid chromatography.

To understand more fully the potential availability of petroleum hydrocarbons to marine organisms inhabiting the water column (both in the natural environment and in experimental situations devised to test the effects of hydrocarbons), a series of laboratory experiments were undertaken to study the accommodation of three different types of oil in seawater under different experimental conditions. Concentrations of oil accommodated in seawater under laboratory conditions are directly related to the amount added and the degree of turbulence, but inversely related to temperature. The major fraction (87-98 percent) of this oil is in particulate form ranging in size from about 1 to 30 microns, presumably small droplets. The exact ratio of the particulate to subparticulate fractions is directly related to the apparent viscosity of each individual oil. Of the total amount of oil initially added, 9-15 percent appeared in seawater at the end of the 7-days experiments. Except in the proximity of recent oil slicks, the oil concentrations observed in these experiments are one to two orders of magnitude greater than the concentrations generally observed in the marine environment off eastern Canada. (Holoman-Battelle)
W74-04775

HETEROTROPHIC UTILIZATION OF SUCROSE IN AN ARTIFICIALLY ENRICHED LAKE,
Manitoba Univ., Winnipeg. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W74-04781

MEASUREMENT OF ADENOSINE TRIPHOSPHATE (ATP) IN TWO PRECAMBRIAN SHIELD LAKES OF NORTHWESTERN ONTARIO,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. W. M. Rudd, and R. D. Hamilton.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1537-1564, October 1973. 8 fig, 1 tab, 16 ref.

Descriptors: *Primary productivity, *Secondary productivity, *Lakes, Measurements, Separation techniques, Filtration, Water analysis, Sampling, Particle size, Carbon, *Canada, Chlorophyll.
Identifiers: *Adenosine triphosphate, Sample preparation.

Water samples were collected in Van Dorn bottles from lakes 227 and 302 in the precambrian shield area of northwestern Ontario for analysis of ATP over several months. Samples were filtered through a 250-micron net and three subsamples prepared for extraction by passing through a 0.22-micron, 47-mm GS Millipore filter and 10-micron and 56-micron nylon mesh filters. ATP analyses were performed under diffuse incandescent light in modified glass scintillation vials. Large seasonal changes were evident, as were specific sites of high biological activity due either to natural stratification or to deliberate manipulation. Chlorophyll a, particulate carbon, and direct count data were found to be misleading in specifying the changes or the sites of biological activity. Analysis of the ATP data on the basis of the relative abundance of different size fractions was found to be useful. An ATP filtration error could not be demonstrated, indicating that cell breakage is not a source of the filtration error inherent in some C-14 primary and secondary productivity studies. (Little-Battelle)
W74-04782

MOVEMENTS OF PHOSPHORUS BETWEEN ITS BIOLOGICALLY IMPORTANT FORMS IN LAKE WATER,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
D. R. S. Lean.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1525-1536, October 1973. 9 fig, 2 tab, 18 ref.

Descriptors: *Phosphorus, *Path of pollutants, *Lakes, *Epilimnion, *Kinetics, *Cycling nutrients, Movement, Model studies, Freshwater, Phosphates, Phosphorus radioisotopes, Filtration, *Organophosphorus compounds, Radioactivity, Ion exchange, Eutrophication, Anionic exchange.
Identifiers: Orthophosphates, Molecular weight, Particulate matter, *Dissolved phosphorus, Membrane filters, Transfer rates, Heart Lake, Colloidal phosphorus.

A model consistent with the kinetics of phosphorus in epilimnetic lake water was developed. Adding P-3204 to lake water and separating the major forms of dissolved phosphorus by Sephadex gel filtration showed that the exchange mechanism between inorganic phosphate and the particulate fraction predominates. At the same time, a low-molecular-weight phosphorus compound is excreted which combines with colloids in lake water, releasing phosphate from the colloid and making the phosphate available for 'transfer' again. This rapid cycling of phosphorus between the four principal forms - the particulate fraction, the low-molecular-weight P compound, colloidal P, and phosphate - appears to contribute to formation of colloids in lake water. No direct complexing of phosphate to the colloid was observed. Only in the presence of algae, bacteria, and other particulate matter did the radioactive phosphorus move to the low-molecular weight and the colloidal forms. The low-molecular-weight compound is negatively charged, as is the colloidal P, but to a lesser degree. Both are removed by anion exchange materials along with phosphate, but the rate that they move into the fraction removed by membrane filtration is different from that for phosphate. This complicates measurements of transfer and makes previous studies on utilization of dissolved organic phosphorus of doubtful value since corrections for filter retention were rarely, if ever, made. (Holoman-Battelle)
W74-04783

DISTRIBUTION AND UPTAKE OF ARTIFICIALLY INTRODUCED RADIUM-226 IN A SMALL LAKE,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
S. Emerson, and R. Hesslein.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1485-1490, October 1973. 3 fig, 1 tab, 12 ref.

Descriptors: *Lake sediments, *Absorption, Ecological distribution, *Detritus, *Canada, Chemical analysis, *Path of pollutants, *Radium radioisotopes, Littoral, Diatoms, Aquatic algae, Deep-water habitats, Water analysis, Adsorption, Bottom sampling, Water sampling, Radioactivity techniques, Lakes.
Identifiers: Ra-226, Epilithophyton, Gas exchange rates, Algal counts, Pollutant removal, Rn-222.

Radium-226 was added to lake 227 of the Experimental Lakes Area in August, 1970, so that gas-exchange rates between the atmosphere and the lake could be traced by its gaseous daughter product radon-222. Although the radium was expected to remain in solution it did so for only about 1 month. An investigation was made to locate the radium after it left solution. Water and deep water surface sediment samples and algal (epilithophyton) and detrital material were analyzed in order to determine radium distribution. Since Ra was found to be highly concentrated in rock scrapings, an attempt was made to correlate Ra uptake with epilithophyton carbon fixation. Algal-detrital material from nonlabelled lakes (lakes 239-and 240) with natural radium activities (0.1 dpm/liter) was analyzed for Ra by liquid scintillation counting in a dioxane fluor. In lake 227 radon activity decreased toward the center, thus confirming that the radon source was the littoral zone. Radium activity of rock scrapings and surface sediment further indicated that radium was concentrated on the littoral bottom surface. Results of two successive scrapings of the same rocks from lake 227 showed that the radium analyzed in these scrapings was concentrated in the algal or detrital coating of the rock and not from the rock itself. Two years after labelling lake 227, activities in the surface sediments below 8 m were as high as 660 dpm/g of dried sediment. Radium uptake had no relation to the carbon fixation rate. Laboratory tests determining radium removal rate indicated no significant difference between removal by unaltered algal-detrital material and boiled algal-detrital material. (Holoman-Battelle)
W74-04785

A NUMERICAL MODEL FOR DETERMINING INTEGRAL PRIMARY PRODUCTION AND ITS APPLICATION TO LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 5C.
W74-04786

THE TRANSPORT OF ORGANIC CARBON TO ORGANISMS LIVING IN THE DEEP OCEANS,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W74-04790

A REPORT ON THE LIMNOLOGY OF MONROE RESERVOIR, INDIANA,
Indiana Univ., Bloomington. School of Public and Environmental Affairs.
For primary bibliographic entry see Field 2H.
W74-04792

SOLUBLE PHOSPHATE OUTPUT OF AN AGRICULTURAL WATERSHED IN PENNSYLVANIA,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
W. J. Gburek, and W. R. Heald.
Water Resources Research, Vol 10, No 1, p 113-118, February 1974. 1 fig, 1 tab, 10 ref.

Descriptors: *Phosphates, *Water pollution sources, *Fertilizers, Leaching, Land use, *Pennsylvania, Path of pollutants, *Agricultural watersheds.
Identifiers: *Mahantango watershed(Penn).

Soluble phosphate data were collected from the stream draining a 7.7 sq km Pennsylvania agricultural watershed. The stream approaches constant and low phosphate concentrations of 10 ppb or less PO4-P during continuing base flow recession. Concentrations vary seasonally, 10 to 15 ppb PO4-P commonly occurring in the winter and 20 to 30 ppb occurring in the summer. Less than 2% of the P applied to the watershed as fertilizer is carried out of the watershed by the stream in the soluble form. Most of this output is associated with the high flows and low concentrations found in the early spring. The land adjacent to the stream channel and its indigenous vegetation can be a direct source of soluble phosphate to the stream during periods of precipitation. This makes the PO4-P levels observed at the watershed outlet the result of near- and in-stream processes and reduces the importance of general land use of a watershed as a determining factor in the soluble phosphate concentrations in the stream. (Knapp-USGS)
W74-04804

VERIFICATION OF WATER TEMPERATURE FORECASTS FOR DEEP, STRATIFIED RESERVOIRS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 4A.
W74-04807

PROBLEM OF PURE WATER IN THE USA, (IN RUSSIAN),
Vsesoyuznyi Institut Nauchno-Tekhnicheskoi Informatsii po Selskomu Khozyaistvu, Moscow (USSR).
For primary bibliographic entry see Field 5G.
W74-04837

DISTRIBUTION OF ORGANIC MATTER AND BACTERIA IN THE UPPER LAYER OF BOTTOM DEPOSIT OF LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
J. E. Ponyi, J. Olah, and A. Franko.
Ann Inst Biol (Tihany) Hung Acad Sci. 39: p 141-148. Illus. 1972. (Hungarian summary).
Identifiers: *Bacteria, Bottom deposits, *Distribution, *Hungary(Lake Balaton), Nitrogen, *Organic matter, Water pollution sources.

The upper layer of the bottom deposit in the open water of Lake Balaton (Hungary) is poor in organic materials. The values obtained were 3-4% except for the Bay of Keszthely where values of 8-9% were registered. Noteworthy quantitative differences in the organic matter content between the different points of the individual transversal sections were found only in the Bay of Keszthely. Values of Kjeldahl-N content in the different areas of bottom are nearly identical (0.3-0.5%). Amounts of HCl-soluble materials in the Bay of Keszthely and its neighborhood are 46-51% and in the other areas of the lake over 60%, and proceeding from the southern shore northward the amounts increase in most of the transversal sections. Average bacterial counts and the amounts of the 3-5 micro fractions of particulate organic materials in the bottom are generally higher in the Bay of Keszthely and its neighborhood than in other areas of the lake. The quantitative distribution of bacteria and particulate organic materials along the transversal sections is heterogeneous.--Copyright 1973, Biological Abstracts, Inc.
W74-04839

AN EXPERIMENT IN SANITARY-VIROLOGICAL RESEARCH ON SEWAGE, (IN RUSSIAN),
A. P. Markov.
Gig Sanit. 37(2): 94-95. 1972.
Identifiers: Agglutination, Centrifugation, Cultures, Embryo, Erythrocyte, Ether, Fibroblast, Penicillin, *Sanitary engineering, *Sewage, Streptomycin, Tampon, *Virological research, *Enteroviruses, Antibiotic treatment.

Wide distribution of enteroviruses in sewage was established. A study done from 1968-1970 isolated viruses from sewage obtained by the tampon method. After centifugation, part of the sample was treated with antibiotics (penicillin and streptomycin) and the rest with ether. Pathogenic agents were identified by hemagglutination with human erythrocytes, hemagglutination lag and neutralization with type-specific sera. Strains (40) of virus were isolated from samples treated with antibiotics and 28 strains from samples treated with ether. In human embryo fibroblast cultures, 72 virus strains were isolated from samples treated with antibiotics and 38 strains from samples treated with ether. Partial loss of viruses apparently occurs during antibiotic treatment.--Copyright 1973, Biological Abstracts, Inc.
W74-04849

SALMONELLA SEROTYPES IN SEWAGE OF VARIOUS ORIGINS,
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
G. P. Kalina, and V. L. Shiganova.
Gig Sanit. 37(2): 104-106. 1972.
Identifiers: Animal, Birds, Cat, Cattle, Cold, Dog, *Epidemiology, Meat, Processing, Rodent, *Salmonella serotypes, *Sewage, Strain, Swine, *Enterobacteria.

Pathogenic enterobacteria were studied in waste fluids from 3 drains of a meat reprocessing plan (MRP), 2 of which contained manufacturing waste and 1 containing fecal material, and 2 aeration stations (AS) containing fecal waste before and after sterilization. Strains of Salmonella (194) of various serotypes were isolated. In MRP sewage, groups E anc C1 (12 strains) predominated, in AS sewage, serogroup B predominated. Some group D Sal-

monella were found in MRP samples. C2 was distributed almost evenly in both. Three types of Salmonella are discussed: those associated with humans, rodents, dogs, and cats, those associated with cattle, swine and domesticated birds, and those associated primarily with wild birds and cold blooded animals. Numerous examples are given. The determination of Salmonella serotypes in various types of sewage is of epidemiological and sanitary importance.--Copyright 1973, Biological Abstracts, Inc.
W74-04850

5C. Effects Of Pollution

NUTRIENT INCOME CHANGE RELATED TO PLANKTON ALGAE,
Washington Univ., Seattle. Dept. of Civil Engineering.
E. B. Welch, R. M. Emery, C. E. Moon, and D. Spyridakis.
Completion Report, August 25, 1972. 39 p, 7 fig, 8 tab, 18 ref. OWRR A-045-WASH(1).

Descriptors: *Diversion, *Phosphorus, *Eutrophication, *Mesotrophy, Plankton, *Washington, Lakes, Lake sediments, Nutrients, *Phytoplankton, Productivity, Anaerobic conditions, Nitrogen, Iron.
Identifiers: *Lake Sammamish(Wash).

Lake Sammamish, which lies about 12 miles east of Seattle, Washington, with moderate depth (mean 17.7m) and area (19.8 km sq.), can be classified mesotrophic. While diversion of over 1/2 the phosphorus (P) from nearby Lake Washington during 1963-67 was followed by reduction in winter mean P content and a rapid shift from eutrophy to mesotrophy (Edmondson, 1970), mean winter P content and measured characteristics of plankton response have not changed significantly in Lake Sammamish following a diversion of similar magnitude. Annual nutrient budgets suggest a reduction in sedimented P since diversion but little change in the quantity of P released from anaerobic sediment. P availability in the water column (winter mean content) appears to be controlled by iron precipitation to a greater extent than in Lake Washington. Experiments in situ show that nitrogen and P are equally limiting to summer phytoplankton productivity, but as found in Lake Washington, P may be of more long term significance. Urban runoff is apparently not enriching the lake to a great extent and therefore has probably not retarded the recovery of the lake.
W74-04318

ENVIRONMENTAL MONITORING AND DISPOSAL OF RADIOACTIVE WASTES FROM U.S. NAVAL NUCLEAR-POWERED SHIPS AND THEIR SUPPORT FACILITIES, 1972,
Department of the Navy, Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-04441

ECODISTRIBUTION OF PLUTONIUM IN LIQUID WASTE DISPOSAL AREAS AT LOS ALAMOS,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 5B.
W74-04443

ANNUAL CONSUMPTION OF CESIUM-137 AND COBALT-60 LABELED PINE SEEDS BY SMALL MAMMALS IN AN OAK-HICKORY FOREST,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-04450

ENVIRONMENTAL SURVEILLANCE FOR FUEL FABRICATION PLANTS,
Battelle Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5B.
W74-04451

VERTICAL DISTRIBUTION OF FISHES RELATIVE TO PHYSICAL, CHEMICAL AND BIOLOGICAL FEATURES IN TWO CENTRAL ARIZONA RESERVOIRS,
Arizona State Univ., Tempe.
P. O. Bersell.
Available from NTIS, Springfield, Va 22151 as COM-73-11333 Price $5.75 printed copy; $1.45 microfiche. M Sc Thesis, September 1973. 65 p, 9 fig, 10 tab, 33 ref.

Descriptors: *Reservoirs, *Arizona, *Fish populations, Water pollution effects, Variability, Ecology, *Food chains, Seasonal, Aquatic populations, Ecosystems, Thermal stratification, Euphotic zone, Dissolved oxygen, Chlorophyll, Plankton, Water temperature.

Distribution of fishes in two central Arizona reservoirs was studied by vertical gill netting, stressing intra- and inter-lake variability. Transects were established and sampling was performed three times a year in an attempt to examine variations during ecological seasons. Data on fish distributions, other biotic factors, and selected physicochemical features were obtained. Multiple linear regression analysis was employed to determine which abiotic and biotic features were most important to vertical dispersion of fishes. Despite high variability and often small sample size, data suggested dissolved oxygen, chlorophyll-a, plankton, and to a far lesser extent, temperature, were important factors in fish dispersion patterns. Vertical light penetration (depth of the euphotic zone) seemed to act in a more subtle, indirect manner in its influence on fishes. Species interactions were noted and foodchain relationships seemed apparent in many instances. The majority of all fishes netted in the study (1970-71) were within the upper 10 m of the water column in both reservoirs. (Knapp-USGS)
W74-04474

CONCERNING LARGE-SCALE CULTIVATION OF THERMOPHILIC COSMOPOLITAN MASTIGOCLADUS LAMINOUSUS COHN (CYANOPHYTA) IN ICELANDIC HOT SPRINGS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Institut fuer Molekularbiologie und Biophysik.
For primary bibliographic entry see Field 2I.
W74-04486

RELATIVE SUSCEPTIBILITY OF LAKES TO WATER-QUALITY DEGRADATION IN THE SOUTHERN HOOD CANAL AREA, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 5B.
W74-04488

ESTIMATING THE BENEFITS OF STREAM VALLEY AND OPEN SPACE PRESERVATION PROJECTS,
Regional Science Research Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 6B.
W74-04500

EFFECTS OF CONDENSATES ON THE TOXICITY OF KRAFT PULP MILL EFFLUENTS,
B.C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5D.
W74-04521

BIOCHEMICAL ECOLOGY OF WATER POLLUTION,
Ohio State Univ., Columbus. Dept. of Microbiology.
P. R. Dugan.
Plenum Press, New York, N.Y. (and London, England), 1972. 159 p, 37 fig, 17 tab, 144 ref. Price: $14.50.

Descriptors: *Water pollution effects, *Aquatic life, *Water properties, *Ecology, *Pollutants, Toxicity, Water pollution, Water pollution sources, Organic loading, Organic compounds, Nutrients, Eutrophication, Lakes, Water types, Biodegradation, Biochemistry, Water chemistry, Pesticides, Detergents, Carbohydrates, Proteins, Amino acids, Lipids, Lignins, Water resources, Water supply, Hydrologic cycle, Inorganic compounds, Radioactive wastes, Thermal pollution, Mine drainage.

Information is presented on biological and biochemical reactions important to the understanding of water pollution and its effects on organisms at the cellular and molecular levels. The 12 chapters deal with the following topics: Significance of water pollution; Causes and types of pollutants (inorganic, organic, toxic, radioactive, pathogenic, thermal, etc.); Water availability and use (hydrological cycle, first- and second-order pollution); Biochemical aspects of pollution; Ecological concepts such as symbiosis; Chemical, physical, and biological characteristics of water; Degradation of organic pollutants (hydrolytic, oxidative, and dissimilative reactions of polysaccharides, proteins, fats, amino acids, etc.); Recalcitrant molecules (ENVIRONMENTAL PROTECTION FACILITIES AT THE RECENTLY EXPANDED PULP AND PAPER MILL OF Continental Can Co. in Hodge, La., is an effluent decoloring system, in which lime is added to the waste waters entering the first clarifier stage. Sludge from this primary clarifier, including precipitated color bodies, is incinerated in the mill's lime kiln for recovery of lime. Dissolved lime remaining in the clarified effluent is recovered by treatment with lime kiln stack gases which provide the carbon dioxide needed to precipitate dissolved lime as Ca carbonate. The pH of the clarifier effluent is adjusted before it enters the oxidation ponds for secondary treatment. Air pollution abatement facilities at the mill are also described. (Witt-IPC)
W74-04523

A PRELIMINARY SURVEY OF THE POSSIBLE CONTAMINATION OF LAKE NAKURU IN KENYA WITH SOME METALS AND CHLORINATED HYDROCARBON PESTICIDES,
Utrecht Rijksuniversiteit (Netherlands). Inst. of Veterinary Pharmacology and Biological Toxicology.
J. H. Koeman, J. H. Pennings, J. M. De Goeij, P. S. Tjioe, and P. M. Olindo.
J Appl Ecol. Vol 9, No 2, p 411-416, 1972, Illus.
Identifiers: Birds, *Chlorinated hydrocarbon pesticides, *Copper, Fish, *Kenya(Lake Nakuru), Lakes, Metals, Pesticides, Survey, Toxicity, *Zinc, Soda-lakes.

In the period of sampling, chlorinated hydrocarbon pesticides and 6 selected metals probably did not represent a hazard to the fish and birds in Lake Nakuru. With respect to Zn and Cu a more detailed study will be required to measure the toxicity of these elements alone and in combination under the peculiar environmental conditins of this soda-lake. This type of information will be needed for the evaluation of tolerance limits with regard to pollution problems which may arise in the future. These data should provide useful baseline information for monitoring future trends of pollution in this part of the world.--Copyright 1973, Biological Abstracts, Inc.
W74-04547

WATER QUALITY REQUIREMENTS OF AQUATIC INSECTS,
Utah Univ., Salt Lake City. Dept. of Botany.
A. R. Gaufin.

Copy Available from GPO Sup Doc as EP1.23:660/3-73a004, $1.20; microfiche from NTIS as PB-228 582, $1.45. Environmental Protection Agency Ecological Research Series Report, EPA-660/3-73-004, September 1973. 89 p, 3 fig, 15 tab, 50 ref. EPA Project 18050 FLS.

Descriptors: Water pollution effects, Water quality, *Aquatic insects, *Thermal pollution, *Dissolved oxygen, *Hydrogen ion concentration, Diptera, Mayflies, Stoneflies, Mayflies, Caddisflies, Water temperature.
Identifiers: Pollution evaluation, Water quality criteria, Receiving waters, *Water quality requirements, Trichoptera.

The larvae of twenty species of aquatic insects (Diptera, Ephemeroptera, Plecoptera, and Trichoptera) and the scud (Amphipoda) were exposed to high water temperatures, low dissolved oxygen concentrations, and low pH to determine their tolerance of these three environmental factors. The temperature at which 50% of the specimens died after 96 hours exposure ranged from 11.7C for the mayfly. Cinygmula par Eaton, to 32.6C for the snipe fly, Atherix variegata Walker. The mayfly, Ephemerella doddsi Needham, was most sensitive to low dissolved oxygen levels with a 96-hour TLm of 5.2 mg/1. Acroneuria pacifica Banks, a stonefly, was the most resistant with a TLm 96 of 1.6 mg/1. Median tolerance levels for pH ranged from pH 2.7 for the caddis fly, Limnephilus ornatus Banks, to 7.2 for the scud, Gammarus limaeus Smith. Longer term bioassays clearly indicated increased sensitivity and mortality of the test specimens with increased length of exposure to each of these factors. To maintain a well-rounded diversified population of cold water aquatic insects, maximum temperatures, minimum dissolved oxygen levels, and the pH range should not exceed the requirements of cold water fishes, such as trout and salmon. While some aquatic insects can tolerate dissolved oxygen levels as low as 1.6 mg/1 for short periods, concentrations of 6.0 mg/1 are required for long-term survival. Temperatures during the winter months must be maintained at normal seasonal levels to prevent premature emergence. Temperatures above 65F during the summer months are considered the maximum for maintaining many species of stoneflies, mayflies, and caddis flies. A pH range of 6.0-8.5 should protect most cold water lotic insects. (EPA)
W74-04551

EFFECT OF PHOSPHORUS REMOVAL PROCESSES ON ALGAL GROWTH,
California Univ., Irvine.
J. Scherfig, P. S. Dixon, R. Appleman, and C. A. Justice.
Copy Available from GPO Sup Doc as EP1.23:660/3-73-015, $1.20; microfiche from NTIS as PB-228 585. Environmental Protection Agency Ecological Research Series Report EPA-660/3-73-015, September 1973, 81 p, 13 fig, 41 tab, 11 ref. EPA Project 16010 GJH.

Descriptors: *Bioassay, *Algal control, Assay, Tertiary treatment, Eutrophication, Water reclamation, Nutrients, Phosphorus, Waste water treatment, Sewage treatment, California, Water pollution effects.
Identifiers: *Phosphorus removal, *Algal assay procedures, Growth limiting nutrients, Algae growth control, Batch algal assays, Continuous culture assays, Santee(Calif).

Laboratory studies were conducted to improve algal assay techniques for use in evaluation of sewage treatment processes. Laboratory studies (batch and continuous cultures) were conducted at the Santee California water reclamation plant to evalute the effect of tertiary waste treatment processes on the amount of algal growth in the treated effluent. Laboratory studies were also conducted to determine the growth limiting nutrients in each type of tertiary effluent. Field tests were conducted using special study ponds and the results of the field tests were compared with the laboratory test results. The laboratory and field tests showed the same relative ranking for the treated effluents. (EPA)
W74-04552

THE EFFECTS OF METHOXYCHLOR ON AQUATIC BIOTA,
Michigan Dept. of Natural Resources, Ann Arbor. Inst. for Fishery Research.
J. W. Merna, and P. J. Eisele.
Copy Available from GPO Sup Doc as EP1.23:73-046, $0.95; microfiche from NTIS as PB-228 643 $1.45. Environmental Protection Agency Ecological Research Series Report EPA-R3-73-046, September 1973. 59 p, 13 fig, 22 tab, 22 ref. EPA Project 18050 DLO.

Descriptors: *Pesticide toxicity, Pesticides, *Bioassay, Lethal limit, Biota, *Fish reproduction, *Yellow perch, Minnows, Water pollution effects.
Identifiers: Phytotoxicity, Fish toxicity, Fathead minnows, TL-50, *Fathead minnows, Gammarus pseudolimnaeus, Orconectes virilis, *Methoxychlor.

Continuous-flow bioassays yielded 96-hour TL50 values for invertebrates ranging from 0.61 microgram/1 for Gammarus pseudolimnaeus to 7.05 microgram/1 for Orconectes virilis. Fathead minnows (Pimephales promelas) and yellow perch (Perca flavescens) had 96-hour TL50 values of 8.63 and 22.2 micrograms/1 respectively. Hatching of fathead minnow eggs was inhibited at all levels of exposure tested between 1.0 and 0.125 microgram/1. There was no spawning at 2 microgram/1. Growth of yellow perch was retarded at all levels tested between 5.0 and 0.625 micrograms/1. All perch died at 10 micrograms/1 during the growth study. Perch which had been subjected to long-term exposure to 5 microgram/1 of methoxychlor had an abnormally high oxygen demand when held in a respirometer with a water velocity of 0.6 foot per second. (EPA)
W74-04553

THE ANALYSIS OF ARSENIC IN THE LIPID PHASE FROM MARINE AND LIMNETIC ALGAE,
Central Inst. for Industrial Research, Oslo (Norway).
For primary bibliographic entry see Field 5A.
W74-04557

ECOLOGICAL INVESTIGATIONS OF PONDS WITH SPECIAL REGARD TO THE CONSEQUENCES OF WATER POLLUTION BY OIL, (IN GERMAN),
Kiel Univ. (West Germany). Zoologisches Institut.
W. Jahn.
Arch Hydrobiol. Vol 70, No 4, p 442-483. 1972, Illus. (English summary).
Identifiers: *Aquatic insects, Ecologicsl studies, *Germany, *Mussels, *Oil pollution, Ponds, *Snails, Water pollution effects.

The occurrence of most species in 13 ponds in NW-Germany did not depend on the type or on the site of the pond. Only a few of the species preferred either wood-ponds or ponds in the open cultivated areas. Ponds refilled with water after desiccation were immediately recolonized by species that had survived in the bottom. Other species immigrated by flight or by crawling from their hiding places in a regular sequence. When the water surface was polluted by thin layers of motor oil many of the aquatic insects were killed. The dangerous effects of the oil decreased rapidly within a few days. Snails and mussels fed on oil and even reproduced later on. The fauna which did not come into direct contact with the film of oil was endangered by oil only above a high concentration.--Copyright 1973, Biological Abstract, Inc.
W74-04635

THE RELATION BETWEEN PHYTOPLANKTON AND PHOSPHATE IN THE LAKE OF CONSTANCE, (IN GERMAN),
Staatliches Institut fuer Seenforschung und Seenbewirtschaftung, Konstanz (West Germany). Abteilung Max Auerbach-Institut.
H. Lehn.
Arch Hydrobiol. Vol 70, No 4, p 556-559. 1972, Illus, (English summary).
Identifiers: *Germany(Lake of Constance), Lakes, *Phosphates, *Phytoplankton, *Phosphorus.

Since 1920 two criteria of water quality, the phosphate-phosphorus-concentration during winter circulation and the phytoplankton density, have increased greatly. In the half-logarithmic system of coordinates a straight line runs through the relative points, and this is higher in the shallow Gnadensee than in the deep Obersee. With increasing phosphate concentration the efficiency of phytoplankton production in both basins of the lake decreases logarithmically.--Copyright 1973, Biological Abstracts, Inc.
W74-04637

ECOLOGICAL CHARACTERISTICS OF GO-NO-IKE LAKE,
Tokyo Univ. (Japan). Ocean Research Inst.
H. Seki, M. Takahashi, Y. Yamaguch, and S. Ichimura.
Arch Hydrobiol. Vol 70, No 4, p 425-441, 1972, Illus.
Identifiers: *Algal ooze, Ecological studies, *Japan(Go-No-Ike Lake), Lakes, *Eutrophication, *Productivity.

The ecological characteristics of an eutrophic lake, Go-no-ike Lake, Japan, were investigated with special references to its high biological productivity and to the significance of the algal ooze in the ecological system in the lake.--Copyright 1973, Biological Abstracts, Inc.
W74-04638

EFFECTS OF TOXICANTS ON BRACKISH-WATER PHYTOPLANKTON ASSIMILATION,
Institute of Marine Research, Helsinki (Finland). Biology Div.
A. Niemi.
Comment Biol Soc Sci Fenn. 55. p 1-19. 1972. Illus.
Identifiers: Brackish water, *Copper ions, *Cyanides, *Phenols, *Phytoplankton, Potassium cyanide, *Sulfates, Toxicants, Water pollution effects, *Finland.

The acute effect of CuSO4, pure phenol and KCN on the assimilation rate and dark fixation of vernal, early summer and late summer phytoplankton communities was studied in situ at Tvarminne Zoological Station, south coast of Finland. Low concentrations of all the 3 chemicals had a stimulating effect. At a certain concentration of each chemical, an inhibitory effect became apparent in both assimilation and dark fixation tests. At higher concentrations the inhibitory effect was total in the assimilation, but the dark fixation values did not decrease to zero. There was no clear difference in the susceptibility of vernal, early summer and late summer phytoplankton communities to the toxicants, except that the vernal phytoplankton community seemed to be less susceptible to ionic Cu than the other communities. This may depend on differences in the species composition between the vernal and summer communities.--Copyright 1973, Biological Abstracts, Inc.
W74-04644

CALCULATION OF THE CONCENTRATION OF THE BIOMASS OF BLUE-GREEN ALGAE DURING SETTLING, (IN RUSSIAN),
Ukrainskii Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Kiev (USSR).
I. I. Kalantyrenko.
Gidrobiol Zh. Vol 8, No 5, p 127-132. 1972. Illus.

Identifiers: *Algae, *Biomass, Calculations, Reservoirs, Settling, *Cyanophyta, *Eutrophication, *Bioassay.

In connection with the problem of water bloom in reservoirs due to the massive reproduction of blue-green algae, the problem of removing the algae from the water and concentrating them is discussed. One of the ways of obtaining the algal biomass consists in collecting the concentrated masses at 'bloom spots' by floating pump plants which are equipped with suction devices that gather and pump only the upper water layer most saturated with algae. Formulas are given for determining the rate of settling of the water-alga mixture, during which the algae usually floats, forming on the surface of the settling tank a more concentrated biomass layer.--Copyright 1973, Biological Abstracts, Inc.
W74-04645

LITTORAL VEGETATION OVERGROWING IN SOME LAKES OF KALININ DISTRICT, (IN RUSSINA),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 2H.
W74-04646

PHYTOPLANKTON DYNAMICS IN THE SEVERSKIY DONETS RIVER FOR THE FIRST YEARS AFTER ITS REGULATION, (IN RUSSINA),
Kharkov State Univ. (USSR).
R. P. Zhupanenko.
Gidrobiol Zh. Vol 8, No 5, p 28-35. 1972. (English summary).
Identifiers: Autumn, *Bacillariophyta, *Chrysophyta, *Cyanophyta, Dams, *Phytoplankton, Regulation, Rivers, Seasons, *USSR(Severskiy-Donets River), Summer, Biomass, Reservoirs.

The phytoplankton study in the Severskiy Donets River (USSR) above and below the dam, and the weir pool of the Pechenezhskoye Reservoir showed that in the winter through spring period, the basic part of the number and biomass of the phytoplankton below the dam and in the weir pool is formed by Bacillariophyta and Chrysophyta and in the summer and autumn by Cyanophyta. Under the effect of Pechenezhskoye Reservoir, the number and biomass of the phytoplankton below the dam is increasing, together with decrease in the number of species.--Copyright 1973, Biological Abstracts, Inc.
W74-04648

TEMPERATURE ACCLIMATION IN THE MEDUSA, CHRYSAORA QUINQUECIRRHA,
Georgetown Univ., Washington, D.C. Dept. of Biology.
R. S. Blanquet.
Comparative Biochemistry and Physiology, Vol 43B, No 3B, p 717-723, 1972. 3 fig, 19 ref.

Descriptors: Adaptation, *Aquatic animals, *Enzymes, *Metabolism, *Temperature, Biochemistry, Physiology, Reproduction, Environmental effects, Thermal pollution, Laboratory studies, *Chesapeake Bay, Water pollution effects.
Identifiers: *Medusa.

The levels of the two enzymes, Glucose-6-phosphate dehydrogenase and 6-phosphogluconic acid dehydrogenase, were chosen as indices for this investigation of the Cnidarian thermal acclimation of this medusa species. Chrysaora polyps possessing G6PDH and 6PGDH were acclimated to cold and warm water and the enzyme activity was assayed. G6PDH activity was observed but there was little or no 6PGDH activity. Cold acclimated animals demonstrated a dramatic rise in G6PDH specific activity at all substrate concentrations and temperatures tested. This increase was accompanied by a reduced Michaelis constant and energy of activation. A temperature dependent change occurred at about 10C in both groups so that specific activity was greater at that temperature than at 15C. This was more pronounced in the cold acclimated animals. It is suggested that these data are of adaptive significance with respect to pedal cyst formation at low ambient temperatures. (Jerome-Vanderbilt)
W74-04660

THERMAL RESPONSES IN CIRRHINA MRIGALA FRY,
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
M. C. Balani, and R. Viswanathan.
Current Science, Vol 42, No 6, p 192-194, March 20, 1973. 4 fig, 2 tab, 7 ref.

Descriptors: *Carp, *Temperature, *Fish behavior, *Mortality, Aquatic environment, Aquatic animals, Toxicity, Indicators, Laboratory tests, Evaluation, Heat, Physiology, Pathology, Thermal pollution, *Thermal stress.

Temperature plays a dominant role in regulating growth, reproduction, and other aspects of physiology in aquatic species. Studies of the reactions of aquatic organisms to temperature shifts are of particular significance to commercial fisheries. The opercular movement is a conventional indicator of fish response to thermal stress, but the temperature of loss of equilibrium is now considered to be a more effective death point indicator. Results of responses of carp fry exposed to conditions of thermal stress and shock are presented. Elevated water temperatures ranged from 30 to 39C. The median lethal temperature was 37.8C. Significant differences in thermal responses were observed between fry and fingerlings. A high rate of mortality was observed when fry were returned to non-lethal temperatures after being exposed to thermal shock at 38.0 and 39.2C. (Jerome-Vanderbilt)
W74-04661

EFFECTS OF TEMPERATURE ON DEVELOPING MERISTIC STRUCTURES OF SMALLMOUTH BASS, MICROPTERUS DOLOMIEUI LACEPEDE,
Pan American Univ., Edinburg, Tex. Dept. of Biology.
C. R. Wallace.
Transactions of the American Fisheries Society, Vol 102, No 1, p 142-145, 1973. 3 fig, 1 tab.

Descriptors: *Bass, *Temperature, *Growth rates, *Fish physiology, Environmental effects, Aquatic environment, Fish, Cytological studies, Inhibitors, Mortality, Laboratory tests, Measurements, Evaluation, Water temperature, Water pollution effects.
Identifiers: *Meristic structures.

Environmental temperatures affect the number of meristic structures in some fish. Generally, highest meristic structure counts in fishes are associated with lower temperatures and longer development and the lowest counts are associated with higher temperatures and rapid development. Studies were conducted to determine the effects of temperature on the numbers of lateral line scales, right and left pectoral fin rays, dorsal fin soft rays and spines, and anal fin soft rays and spines of laboratory raised smallmouth bass. Eggs were collected, divided into 5 groups and placed in constant temperature tanks set at 17, 20, 23, 26 and 29C. All smallmouth bass were raised to approximately 40-75 mm in total length, killed and subjected to meristic counts. Definite relationships were found between temperature and mean numbers of lateral line scales, anal spines and dorsal soft fin rays; while right and left pectoral fin rays, dorsal spines and anal soft fin rays were not significantly different. Mean numbers of lateral line scales for the five temperature lots yielded a sigmoid curve, higher at 20 and 29C than at 17, 23 and 26C. Mortality was the highest at 17C (84.3%) and 29C (95.4%). The lowest mortality occurred at 23C (35.1%). (Jerome-Vanderbilt)
W74-04663

THE PREFERRED TEMPERATURE OF FISH AND THEIR MIDSUMMER DISTRIBUTION IN TEMPERATE LAKES AND STREAMS,
Department of Lands and Forests, Maple (Ontario). Research Branch.
R. G. Ferguson.
Journal of the Fisheries Research Board of Canada, Vol 15, No 4, p 607-624, 1958. 7 fig, 3 tab, 39 ref.

Descriptors: *Fish, *Yellow perch, *Water temperature, *Distribution patterns, Aquatic environment, Aquatic animals, Fish behavior, Temperature, Laboratory tests, On-site data collections, Heated water, Lakes, Canada, Wisconsin, Tennessee, Trout, New York, Bioassay, Seasonal, Statistical methods, Perches.
Identifiers: *Thermal preference.

Laboratory studies of preferred temperature with yellow perch are compared with 21 other species. These show that temperature, if acting alone, can determine the distribution of fish. Factors such as light, conditioned responses related to feeding, and social behavior interfere with the expression of the response to temperature. The level of thermal acclimation influences the range of temperature preferred. In general the preferred temperature is considerably higher than the acclimation temperature at low thermal acclimations but the difference decreases up to the final preferendum where both coincide. Summer field observations of yellow perch in three lakes in Ontario showed average thermal distribution of 19.7, 21.0, and 21.2C. These temperatures agree well with data from 4 Wisconsin lakes. Oxygen depletion, distribution of primary prey species and other factors are shown to modify the thermal distribution in nature. The agreement between laboratory studies performed with older fish and the field observations was excellent. (Jerome-Vanderbilt)
W74-04666

HEAT - A GROWING WATER POLLUTION PROBLEM,
For primary bibliographic entry see Field 5B.
W74-04668

TEMPERATURE REQUIREMENTS FOR EMBRYOS AND LARVAE OF THE NORTHERN PIKE, ESOX LUCIUS (LINNAEUS),
National Water Quality Lab., Duluth, Minn.
K. E. F. Hokanson, J. H. McCormick, and B. R. Jones.
Transactions of the American Fisheries Society, Vol 102, No 1, p 89-100, 1973. 5 fig, 5 tab, 25 ref.

Descriptors: *Aquatic environment, *Temperature, *Growth rates, *Embryonic growth stage, *Pikes, Aquatic animals, Fish, Environmental effects, Mortality, Growth stages, Larval growth stage, Metabolism, Biomass, Laboratory tests, Bioassay, Evaluation, Water pollution effects.
Identifiers: *Northern pike, Tolerance limits, Heat stress.

Several bioassay methods, responses and end points were evaluated for use in determining the temperature requirements of northern pike embryos. Emphasis was placed on evaluating the relative effects of temperature on embryo survival by correcting for differences in fertilization success among experiments. The most variable end point among experiments was the optimum temperature; while the most reproducible end point was the median tolerance limit (TL50). The lower and upper TL50's were 6.9 and 19.2C for normal hatch

and 6.3 and 19.9C for total hach. The age of the embryo at the time of exposure had a great effect on these tolerance limits. The 1-day upper TL50 for newly hatched and swimming yolk-sac larvae was 28.4C when acclimated to 17.7C. Both larvae stages survived a lower limit of 3.2C for 7 days. Newly hatched yolk-sac larvae were more sensitive than swimming yolk-sac larvae to 7-day exposures to high temperatures. Growth of larvae was maximum at 26C and negligible below 7C. The high larval growth at 26C was offset by an increased mortality rate during the first 2 weeks of life. Net biomass change was highest at 21C. (Jerome-Vanderbilt)
W74-04670

EFFECT OF LIGHT ON VULNERABILITY OF HEAT-STRESSED SOCKEYE SALMON TO PREDATION BY COHO SALMON,
Virgin Islands Dept. of Conservation and Cultural Affairs, Charlotte Amalie, St. Thomas.
J. R. Sylvester.
Transactions of the American Fisheries Society, Vol 102, No 1, p 139-142, 1973. 1 fig, 1 tab, 8 ref.

Descriptors: *Fish behavior, *Salmon, Swimming, Heat, *Predation, *Light, Aquatic environment, Pink salmon, Chum salmon, Sockeye salmon, Temperature, Environmental effects, Fish migration, Stress, Mortality, Laboratory tests, Water temperature, Statistical analysis, Water pollution effects.
Identifiers: *Heat stress.

Light has been shown to affect the migratory behavior of pink, chum and sockeye salmon. Migration during darkness is assumed to be an anti-predator trait. The effect of darkness on untreated and heat-treated sockeye salmon in avoiding coho salmon was investigated. Ten tests were conducted under each of the following conditions; (1) under light with the prey receiving no heat dose; (2) under darkness with the prey receiving no heat dose; (3) under light with the prey receiving a heat dose; and (4) under darkness with the prey receiving a heat dose. Darkness greatly increased survival in prey which both received and did not receive a heat dose. There was a greater proportionate increase in prey survival between light and darkness with no dosage, than between light and darkness with a dosage. A significant interaction was found between light and dose conditions. The coho salmon predators seemed to be aided in locating their prey at night by the erratic swimming of heat-stressed sockeye salmon. (Jerome-Vanderbilt)
W74-04671

RELATION BETWEEN THE AMOUNT OF NET ZOOPLANKTON AND THE DEPTH OF STATION IN SHALLOW LIPNO RESERVOIR,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
Z. Brandl.
Hydrobiol Stud. 3 p, 7-51. 1973. Illus.
Identifiers: *Czechoslovakia(Lipino reservoir), Depth, *Phytoplankton, *Primary production, Reservoirs, Standing crop, *Zoo plankton.

The amount of net zooplankton in stations with varying depths, the primary production of phytoplankton and some chemical and physical properties of water were studied for serveral years in the shallow Lipinreagent permits analysis of high-molecular PEPA in the presence of low-molecular PEPA. Total high-molecular ethyleneamines and low-molecular amines can be determined colorimetrically using pnitrodiazobenzene. PEPA can be analyzed in the presence of PEI using the known colorimetric reaction for secondary amines with 1,2-naphthoquinone-4-sodium sulfonate. The sensitivity is high (0.02 mg/l.).--Copyright 1973, Biological Abstracts, Inc.
W74-04680

A FIND OF MARSH SANDPIPER TRINGA STAGNATILIS IN THE NETHERLANDS,
Amsterdam Univ. (Netherlands). Inst. of Taxonomic Zoology.
E. R. Osieck, and C. S. Roselaar.
Limosa. Vol 45, No 3/4, p 135-138. 1972. (English summary).
Identifiers: Anas-crecca, Anas-strepera, Avocet, *Clostridium-botulinum, Gallinago-gallinago, *Marsh sandpiper, Molting Mortality, *Netherlands, Poisoning, Shelduck, Snipe, Tadorna-tadorna, Teal, Tringa-stagnatilis, *Bacterium, *Waterfowl.

During the hot summer of 1971 the circumstances in the shallow waters of the Dutch new polder Zuidelijk Flevoland were appropriate for the development of the bacterium Clostridium botulinum, type C. The toxin of this bacterium causes food poisoning, botulism, in waterfowl. Thousands of birds were found dead or dying, most of them teal Anas crecca, but also numbers of snipe Gallinago gallinago, shelduck Tadorna tadorna, gadwall Anas strepera, and avocets Recurvirostra avosetta. Among these birds a marsh sandpiper Tringa stagnatilis was found. It is the first such bird collected in the Netherlands and was placed in the collection of the Zoological Museum in Amsterdam. According to plumage and gonads it was a first calendar year bird, molting into winter plumage. The last few years this species has been seen almost once a year in the Netherlands, the first one being observed in 1958.--Copyright 1973, Biological Abstracts, Inc.
W74-04681

CHEMICAL ECOLOGY: EVIDENCE FOR PHOSPHATE AS THE ONLY FACTOR LIMITING ALGAL GROWTH IN LAKE KINNERET,
Weizmann Inst. of Science, Rehovoth (Israel). Isotope Dept.
M. Halmann.
Isr J Chem. Vol 10, No 4, p 841-855. Illus. 1972.
Identifiers: *Algal growth, Chemical ecology, Growth rates, *Israel(Lake Kinneret), Lakes, *Nitrates, *Phosphates, Nutrients.

Experiments on the growth of the natural populations of algae and of other microorganisms as a function of the supply of various nutrients was carried out for Lake Kinneret (Israel) water sampled at about 2 wk intervals during Jan-June 1972. The addition of orthophosphate caused a rapid rise in biomass, which, after several days, increased to 2-5 times that in untreated water, as measured by the increase in turbidity and protein content. The addition of NaNO3 or KNO3, NH4Cl, ferrous ethylenediamine sulfate, sodium silicate or vitamin B12 had no noticeable effect. The plot of biomass versus the concentration of phosphate is a steeply rising function in the range of 0.1 to 1.0 microgram molar orthophosphate, which levels off at higher phosphate concentrations, reaching saturation above about 2 microgram molar phosphate. Thus, in the range of its natural concentration in Lake Kinneret, 0.09-0.5 microgram molar, orthophosphate is the limiting factor. At about 2 microgram molar phosphate, nitrate becomes the limiting factor, as was shown by experiments in which both phosphate (> 2 microgram molar) and nitrate were added, resulting in extremely abundant algal growth. A model of the reduction of nutrient input was achieved by laboratory experiments, in which the lake water was diluted with distilled water (by 1/4), thus resulting in an approximately proportional (to about 1/4) decrease in biomass. The effect of restoring the natural concentration of either nitrate or orthophosphate was then measured. Added nitrate had no effect, while added phosphate caused a rapid increase in biomass, which after 2-4 wk came close to that in the natural lake water. These results indicate that during the spring of 1972, P has been the only element limiting algal growth in the lake.--Copyright 1973, Biological Abstracts, Inc.
W74-04685

DEATH OF THE MARSHES IN THE ARDENNES,
For primary bibliographic entry see Field 4A.
W74-04686

A POSSIBLE EXPLANATION FOR THE DIFFERENCES IN THE FATTY ACID COMPOSITION OF FRESH-WATER AND MARINE FISHES,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
T. Farkas.
Ann Inst Biol (Tihany) Hung Acad Sci. 38: p 143-152, 1971, Illus.
Identifiers: *Algae, Crustacea, Diatoms, *Fatty-Acids, Fishes, Water pollution effects, *Cyanophyta, *Chlorophyta, Plankton.

The differences in the levels of linoleic and linolenic acids can be traced to the differences in species composition of phytoplankton in seas and inland waters. In marine phytoplankton the diatoms with low level of linoleic and linolenic acids predominate. In fresh-water bodies, however, the green and blue-green algae with high levels of both fatty acids prevail. The distribution of these fatty acids in the fats of herbivorous planktonic crustaceans shows the same pattern as in their food. Although both marine and fresh-water fishes were able to desaturate and change linoleic and linolenic acids to long chain polyunsaturated fatty acids, the bulk of these fatty acids originates in lower trophic levels. Some planktonic crustacean species are able to regulate the levels of these fatty acids in their phospholipids according to the environmental temperature. Decrease in the environmental temperature results in an increase of eicosa-, and docosapolyenoic fatty acids in both fresh-water and marine crustaceans. The distrubution of long chain polyunsaturated fatty acids in the triglycerides of marine and fresh-water fishes is similar to that in their natural food. Planktonic crustaceans and fishes can dehydrogenate saturated fatty acids of both endogenous and exogenous origin. This process may modify the ratio of saturated to monounsaturated fatty acids in higher trophic levels as compared to the phytoplankton.--Copyright 1973, Biological Abstracts, Inc.
W74-04688

MORPHOLOGICAL VARIATION OF KERATELLA COCHLEARIS (GOSSE) (ROTATORIA) IN SEVERAL MASURIAN LAKES OF DIFFERENT TROPHIC LEVEL,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
A. Hillbricht-Ilkowska.
Pol Arch Hydrobiol. Vol 19, No 3, p 253-264. 1972. Illus.
Identifiers: *Keratella-cochlearis, Lakes, Morphological studies, Phytoplankton, *Poland(Lake Mikolajskie), *Rotatoria, Seston, Trophic levels, *Eutrophication.

The occurrence of K. cochlearis f. tecta in several water bodies, differing morphologically and trophically, was analyzed, and the occurrence of this form and morphological variation of individual K. cochlearis in the eutrophic Lake Mikolajskie was examined in detail. This species occurs chiefly in the epilimnion, more abundantly and persistently in deeper lakes in comparison to shallower ones, whereas within morphologically similar lakes, it is more numerous in fertile ones. The average size of individuals of K. cochlearis occurring in Lake Mikolajskie is smaller in Aug. than in June, at similar thermal conditions, but different phytoplankton abundance, and attains its maximum in Aug. (biomass about 15 mg/l). The size of individuals of K. cochlearis, including tecta forms occurring in the epilimnion is smaller by 20-25% than that of individuals found in the metalimnion and hypolimnion. The differentiation of individuals is maintained during the whole summer season (comparison was made of results from mid-

June and mid-Aug.) and during the 24 hr cycle.--Copyright 1973, Biological Abstracts, Inc.
W74-04696

PRINCIPLES OF EVALUATING EFFECTS OF THERMAL DISCHARGES ON SURFACE WATERS (GRUNDLAGEN FUR DIE BEURTEILUNG DER WARMEBELASTUNGEN VON GEWASSERN).
Landerarbeitsgemeinschaft Wasser, Mainz (West Germany).
'Warmebelastund der Gewasser' Druckwerkstatten Koehler and Hennemann, Wiesbaden, Germany, October 1971, 84 p, 30 fig, 4 tab, append.

Descriptors: *Thermal pollution, *Heat budget, *Surface waters, Europe, *Water pollution effects, Forecasting, Water temperature, Temperature, Evaporation, Heated water, Seasonal, Meteorology, Rivers, Mixing, Dissolved oxygen, Water quality, Aquatic life, Water chemistry, Estuaries, Wastes, Thermal powerplants, Condensers, Cooling, Air temperature.
Identifiers: *Germany(Rhine River).

The book is subdivided into five chapters each dealing with a separate aspect of assessment of thermal pollution effects. The first chapters discuss natural and induced temperature fluctuations in flowing streams, lakes, estuaries and seas and in groundwater. Of these bodies of water the most threatened are fresh-water surface resources. The relationship between cooling requirements and natural water temperature is briefly discussed. Detrimental effects of heated discharges on the oxygen balance consist mainly of decreasing solubility of oxygen with increasing water temperature and increasing oxygen demand due to increased biochemical reaction rates. Effects on aquatic life of temperature and its variations are discussed from the standpoint of type of species and place of its occurrence. Influence of temperature on other water quality elements such as nitrogen balance, or corrosion properties are outlined. Further chapters deal with methods for estimation of such heat budget elements as influent and effluent temperatures in powerplant condensers, evaporation and radiation heat losses and gains, wind effects, mixing and convection factors, all taking into consideration the annual variation of meteorological conditions. Current and future thermal regimes in the Rhine River basin are presented based on developed predictive models and actual measurements. (Oleszkiewicz-Vanderbilt)
W74-04764

ANALYSIS OF TRACE ELEMENTS, PHOSPHORUS AND SULPHUR, IN THE LIPID AND THE NON-LIPID PHASE OF HALIBUT (HIPPOGLOSSUS HIPPOGLOSSUS) AND TUNNY (THUNNUS THYNNUS),
Central Inst. for Industrial Research, Oslo (Norway).
For primary bibliographic entry see Field 5A.
W74-04770

HYDROCARBON AND CHLOROPHYLL: A CORRELATION IN THE UPWELLING REGION OFF WEST AFRICA,
Kiel Univ. (West Germany). Institut fuer Meereskunde.
For primary bibliographic entry see Field 5B.
W74-04771

APPARATUS FOR RECORDING AVOIDANCE MOVEMENTS OF FISH,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W74-04776

MERCURY UPTAKE AND ION DISTRIBUTION IN GILLS OF RAINBOW TROUT (SALMO GAIRDNERI): TISSUE SCANS WITH AN ELECTRON MICROPROBE,
Michigan State Univ., East Lansing. Dept. of Physiology.
For primary bibliographic entry see Field 5A.
W74-04778

BIOASSAY PROCEDURES TO EVALUATE ACUTE TOXICITY OF NEUTRALIZED BLEACHED KRAFT PULP MILL EFFLUENT TO PACIFIC SALMON,
Fisheries Research Board of Canada, West Vancouver (British Columbia). Pacific Environment Inst.
J. C. Davis, and B. J. Mason.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1565-1573, October 1973. 4 fig, 4 tab, 21 ref.

Descriptors: *Bioassay, *Toxicity, *Sockeye salmon, *Pink salmon, *Pulp wastes, Industrial wastes, Pulp and paper industry, Mortality.
Identifiers: Bleached kraft pulp mill wastes, *Coho salmon, Survival, Data interpretation, Continuous flow system.

A series of bioassays was carried out to assess the acute toxicity of neutralized, filtered, bleached kraft pulp mill effluent (BKME) from a single mill to underyearling Pacific salmon in fresh soft water, at 10-13 C. Toxicity expressed in terms of the 96-hr LC50 varied from 22 percent of full strength BKME to nontoxic in different collections. A procedure is described for estimating the 4-day LC50 from geometric mean survival time data. Toxicity of effluents changed unpredictably with storage (even at 2 C), and declined with air stripping. Comparison of continuous flow and static test procedures indicated that continuous flow procedures yield somewhat higher toxicity results than static tests. Experiments with varying fish densities indicate that measurable toxicity is less in static tests with heavy fish loading. Use of loading densities of 2.5 liters/g fish or better is recommended. Young sockeye salmon (Oncorhynchus nerka) appeared most sensitive, and pink (O. gorbuscha) and coho (O. kisutch) salmon somewhat more resistant to toxic BKME solutions. No correlation was found between time to death and condition factor in the size range of underyearling coho tested (3.0-7.3 cm). Recommendations are made for routine and regulatory bioassay procedures. (Little-Battelle)
W74-04779

EFFECTS OF CADMIUM AND COPPER ON THE OXIDATION OF LACTATE BY RAINBOW TROUT (SALMO GAIRDNERT) GILLS,
Fisheries Research Board of Canada, West Vancouver (British Columbia). Vancouver Lab.
E. Bilinski, and R. E. E. Jonas.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1553-1558, October 1973. 3 fig, 4 tab, 22 ref.

Descriptors: *Bioassay, *Cadmium, *Copper, *Rainbow trout, *Oxidation, Animal physiology, Heavy metals, Toxicity, Water pollution effects, Mortality, Radioactivity techniques, Inhibition, Chemical analysis, Fish physiology.
Identifiers: *Lactates, Sample preparation, Histology, Gills, Biological samples, In vitro tests.

The purpose was to determine whether or not the exposure of rainbow trout to copper and cadmium salt solutions results in a significant inhibition of lactate oxidation in gills. Fish were exposed to 11.2-0.0112 mg/1 CdCl2 for 4-96 hr in fiberglass tanks. After exposure, fish were decapitated, the gill arches cut out, and gill filaments removed and weighed. The oxidative activity in gill filaments was determined by measuring the liberation of C-14-labeled CO2 from C-14-labeled Na-lactate-3-C. Gills were also analyzed for Cd and Cu content and examined histologically. At the highest Cd concentration (11.2 mg/1), fish died in 7 hr. At 1.12 mg Cd/1, fish mortality was 50 percent; of the fish surviving, oxidative activity was inhibited by 50 percent. All fish died in 24 hr when exposed to the highest level of copper (0.636 mg/1). At a concentration of 0.064 mg Cu/1, 50 percent of the fish died; of those surviving, oxidative activity was inhibited by 53 percent. Comparatively high levels of cadmium (20 micrograms) or copper (50 micrograms) were needed to produce in vitro inhibition of lactate oxidation by gill filament. The histological studies suggest that impairment of oxidative activity might be due to disruption of cellular organization or to inhibition of enzyme activity. The lactate oxidation test appears to be useful only at high levels of Cd and Cu, however it could be useful in detecting gill damage with other toxicants. (Little-Battelle)
W74-04780

HETEROTROPHIC UTILIZATION OF SUCROSE IN AN ARTIFICIALLY ENRICHED LAKE,
Manitoba Univ., Winnipeg. Dept. of Microbiology.
B. M. Thompson, and R. D. Hamilton.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1547-1552, October 1973. 3 fig, 18 ref.

Descriptors: *Eutrophication, Kinetics, Bioassay, Metabolism, Water pollution effects, Lakes, Carbon, Nitrogen, Phosphorus, Radioactivity techniques, Sampling, Aquatic microorganisms, *Path of pollutants, Photosynthesis, *Canada.
Identifiers: Substrate utilization, Biotransformation, *Sucrose, Fate of pollutants, *Organic carbon, *Heterotrophic bacteria, Particulate matter, Enrichment.

Lake 304 in the Canadian Shield area was enriched with C, N, and P as sucrose, ammonium chloride, and orthophosphoric acid to investigate the role of organic carbon in eutrophication. The investigation included study of the kinetics of sucrose transformation, comparison of particulate carbon produced by heterotrophic processes with that produced by algal photosynthesis and supplied by other sources, disappearance of sucrose immediately after enrichment using a laboratory experiment, and comparison of the uptake of glucose and sucrose in lakes 304 and 227. The lake was enriched with C-14-labeled sucrose at a rate of 5.54 g C/sq m/yr. Heterotrophic activity exhibited fluctuations representing the damped oscillations of a disturbed steady state system, stabilizing 3 months after the commencement of enrichment. By late summer, reduction of the weekly addition of sucrose to a few micrograms per liter was accomplished within a day by the increased microbial activity resulting from rapid growth of heterotrophic microorganisms. Heterotrophic conversion (preenrichment) of sucrose to particulate carbon in the epilimnion between July and October 1971 was 2-17 percent of primary production. 25-35 percent of total sucrose utilized was converted to carbon dioxide, the remainder being incorporated into particulate material or released as nonvolatile products of metabolism. (Little-Battelle)
W74-04781

DIURNAL VARIATION OF DISSOLVED INORGANIC CARBON AND ITS USE IN ESTIMATING PRIMARY PRODUCTION AND CO2 INVASION IN LAKE 227,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W74-04784

A NUMERICAL MODEL FOR DETERMINING INTEGRAL PRIMARY PRODUCTION AND ITS APPLICATION TO LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
E. J. Fee.

Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1447-1468, October 1973. 16 fig, 1 tab, 28 ref, 1 append.

Descriptors: *Primary productivity, *Lake Michigan, *Phytoplankton, *Light, *Mathematical models, *Carbon, *Computer programs, Statistical methods, Absorption, Data processing, Seasonal, Photosynthesis.
Identifiers: Accuracy.

A computer-based model for determining production by phytoplankton, integrated over depth and over an arbitrary time interval, is described. The solution incorporates light inhibition and uses the actual distribution of surface irradiance for the time interval of interest, since it is not possible to predict the detailed nature of cloudiness. Statistical procedures for estimating the model parameters from experimental data relating the rate of carbon uptake to irradiance are described. The model is applied to data collected from May 27, 1970 through February 3, 1971, from Lake Michigan. Integral primary production was bimodal at inshore and offshore stations with minimum production in midsummer and winter. There was great daily variability of integral production, due to variation of light. From this it inferred that occasional in situ measurements would give a very poor knowledge of true seasonal trends. The model output was verified by performing two in situ experiments. The agreement was better than 95 percent on both dates. The model makes it possible to estimate integral primary production on a routine basis in large water bodies with well-mixed photic zones. (Little-Battelle)
W74-04786

PRODUCTION OF EPILITHIPHYTON IN TWO LAKES OF THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. W. Schindler, V. E. Frost, and R. V. Schmidt.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1511-1524, October 1973. 10 fig, 2 tab, 27 ref.

Descriptors: *Gas chromatography, *Benthic flora, *Primary productivity, *Absorption, *Photosynthesis, *Carbon, Bioassay, Algae, Methodology, Seasonal, Mechanical equipment, Dissolved oxygen, Radioactivity techniques, Chlorophyll, *Canada, Lakes, Periphyton.
Identifiers: Scintillation counting, Substrates, Incubation chambers, Dissolved inorganic carbon, Sample preparation.

Two new techniques for measuring photosynthesis by benthic algal flora in waters low in dissolved inorganic carbon are described. The first uses gas chromatography to measure changes in DIC in incubation chambers directly. The second is a variation of the usual C-14 procedure, in which disappearance of C-14 from the water is measured by liquid scintillation instead of uptake of C-14 by the algae. This procedure is simpler than measuring the uptake of C-14, because digestion and/or combustion of samples is not necessary. Results are compared with the commonly employed C-14 uptake and O2 release techniques. Tests showed that heterogeneity of substrate was the major source of variation in in situ results, being large enough to make interpretation of seasonal effects and other causal factors extremely difficult. Annual production by epilithiphyton in two natural lakes in the Experimental Lakes Area (ELA) was 5.19 g C and 5.18 g C/sq m of substrate annually for lakes 239 and 240, respectively. These are the lowest values recorded for freshwater lakes at temperate latitudes. Because DIC and O2 concentrations could be measured simultaneously, it was possible to calculate photosynthetic quotients on several dates. These were extremely high, averaging 2.6 for the summer of 1971. (Little-Battelle)
W74-04787

EUTROPHICATION OF LAKE 227 BY ADDITION OF PHOSPHATE AND NITRATE: THE SECOND, THIRD, AND FOURTH YEARS OF ENRICHMENT, 1970, 1971, AND 1972,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. W. Schindler, H. Kling, R. V. Schmidt, J. Prokopowich, and V. E. Frost.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1415-1440, October 1973. 15 fig, 4 tab, 26 ref.

Descriptors: Limiting factors, *Phosphates, *Nitrates, *Eutrophication, *Carbon, *Canada, Growth rates, Dominant organisms, *Phytoplankton, *Primary productivity, Nutrients, Standing crops, Succession, Water pollution effects, Photosynthesis, Sedimentation, Lakes, Silicates, Sodium, Dissolved oxygen, Calcium, Magnesium, Potassium, Hydrogen ion concentration, Bicarbonates, Carbonates, Carbon dioxide, Suspended solids, Dissolved solids, Seasonal.
Identifiers: Cryptophyta, Chroococcus, Oscillatoria, Pseudoanabaena, Lyngbya, Coleps, Spondylosium, Synedra, Dictyosphaerium, Oocystis, Ankistrodesmus, Chrysochromulina parva, Chromulina, Chrysococcus, Kepherion, Pseudokepherion, Botryococcus braunii, Dinobryon, Mallomonas pumilio, Staurastrum paradoxum, Staurastrum defectum, Staurastrum boreale, Sphaerozosma granulatum, Spondylosium planum, Chroococcus limneticus, Mallomonas elongatum, Mallomonas caudata, Mallomonas cf. intermedia.

Lake 227, a small lake with extremely low concentrations of dissolved inorganic carbon, was fertilized with PO4 and NO3 for 4 years, beginning in 1969. The additions increased natural inputs of phosphorus and nitrogen about five times. Phytoplankton standing crop increased nearly two orders of magnitude, and the Cryptophyceae and Chrysophyceae present in natural lakes of the area were replaced by Chlorophyta and Cyanophyta. The standing crop of phytoplankton per square meter was near the maximum which could theoretically be maintained by surface light, in spite of the low carbon concentrations. Added phosphate and nitrate were rapidly removed by phytoplankton, so that concentrations in the lake remained low. Almost all of the added nutrient was retained by the lake, in spite of relatively fast water renewal times. An average of 80 percent of the phosphorus income of the lake was sedimented. There was no return of phosphorus from sediments in spite of anoxic conditions in the hypolimnion. Photosynthesizing plankton reduced dissolved inorganic carbon concentrations severely, causing a flux of atmospheric CO2 into the lake. From 69 to 95 percent of the inorganic plus particulate carbon supplied to the lake was from the atmosphere. Results demonstrate that low carbon concentrations do not hinder eutrophication if phosphorus and nitrogen supplies are adequate. (Little-Battelle)
W74-04789

THE TRANSPORT OF ORGANIC CARBON TO ORGANISMS LIVING IN THE DEEP OCEANS,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
R. O. Fournier.
Proceedings of the Royal Society of Edinburgh, Section B (Biology), Vol 73, No 18, p 203-211, 1971-1972. 1 fig, 2 tab, 46 ref.

Descriptors: *Benthic fauna, *Distribution patterns, *Cycling nutrients, Nutrient requirements, Deep water, *Nutrients, Depth, Food chains, Oceans, Sampling, Theoretical analysis, Energy transfer, Deep-water habitats, Spatial distribution.
Identifiers: Transport, *Organic carbon, *Olive-green cells, Marine environment, Sample preparation.

Of the theories which have been proposed to explain the mechanism of organic carbon transport to its point of utilization in the deep ocean, none is adequately quantified to demonstrate its validity. A new mechanism is proposed based upon the occurrence of the so-called olive-green cells at various depths that suggests these cells may contribute up to 35 percent of the carbon requirements of the benthic fauna in the deep ocean. Quantitative data were obtained by collecting water with sterile or non-sterile samplers, filtering it through a membrane filter, and clearing and mounting the filter for microscopic examination. The cells are pigmented, possibly procaryotic organisms of uncertain identity. The cells were generally absent from the upper 50 m, increased in number from 50 m to a maximum at 300-500 m., and gradually decreased down to 400 m. The suggestion that these cells are the source of carbon for benthic organisms is based on three factors. First, the distribution of these cells varies directly with the level of surface productivity. Second, the negative gradient of the cell concentration below 300-500 m suggests that they are utilized throughout the water column. Third, other studies have identified similar cells in the guts of benthic and pelagic organisms. (Little-Battelle)
W74-04790

HORIZONTAL DISTRIBUTION OF SOME CHEMICAL AND PHYSICAL CHARACTERISTICS IN LIPNO RESERVOIR,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
Z. Brandl.
Hydrobiol Stud. 3. p 53-89, Illus, 1973.
Identifiers: Chemical constituents, *Czechoslovakia(Lipno reservoir), Distribution(Horizontal), Physical properties, Reservoirs, *Temperature, *Transparency, *Phosphorus, *Nitrogen.

Temperature, transparency and concentration of some chemical constituents in water were studied at various stations of the shallow, mostly non-stratified Lipno Reservoir (Czechoslovakia) and in some inflows during 1964-66. Slight increase in alkalinity and transparency and decrease of water color and the total P were found from the inflow to the dam. The dissolved and particulate Kjeldahl N had the most constant and the ammonia N the most variable distribution. The variation in nitrate concentration is originated due their more fast decrease at shallow stations. The separated Olsina bay and its inflowing creek differed markedly so that they may be considered as different water masses. The homogeneity of the remaining reservoir was high but different in different years: The variability of stations, was smaller in the years with shorter renewal time of water.—Copyright 1973, Biological Abstracts, Inc.
W74-04814

COMPARATIVE STUDY, IN 1966 AND 1967, OF THREE RESERVOIRS IN THE PROJECT OF A NATURAL PARK IN THE MORVAN REGION (IN FRENCH),
Institut National de la Recherche Agronomique, Thonon-les-Bains (France). Station d'Hydrobiologie Lacustre.
J. Feuillade, and M. Feuillade.
Ann Hydrobiol. 2(2): p 143-174, Illus, 1971, English summary.
Identifiers: *Algae, *Cyanophycea, Fishes, *France(Morvan region), *Microorganisms, Mixing, Oxygen, Parks, Physicochemistry, Recreation, Reservoirs, Sediments, Wind, *Productivity.

The physicochemistry and microbiology of 3 neighboring dammed lakes in France were studied. Settons reservoir is broad and shallow (6.50 m in the middle); water catchment is near the surface, and total water mixing is by wind. Its sediments are the most heterogeneous, thin and lying on a peat older than the lake itself. Crescent reservoir is deeply embanked, or irregular form; each of its 2

branches receives an effluent from the other lakes; it has a depth of 25 m at the station near the dam; there are 2 effluents, 1 above the upper part of the dam and the other at its base. O2 depletion occurs during summer with stagnation in the bottom. Its sediments are the finest and can retain much water; superficial sediments are the most reducing in late hot season. The greatest numbers of microorganisms occur during the warmest months. Chaumecon reservoir has a depth of 32 m at the dam base; the water catchment is at the base of the dam. The uppermost level is productive. There is no appearance of reducing power on the bottom and no diffusion of reduced matter towards the upper layers. Very strong oxidizing activity destroys organic matter. The fish productivity is best. Algal and microbial proulations differ from those of the other lakes. The differences in metabolism of the lakes are caused mainly by the location of the water catchments and by the level variations. A factor stimulating cyanophycean growth appears in Settons Reservoir. For recreational fishing, Crescent Reservoir, which favors aerobic life, is the least favorable.--Copyright 1973, Biological Abstracts, Inc.
W74-04815

MICRO- AND MESOBENTHOS DEVELOPMENT AS A FACTOR OF SOIL COMPOSITION (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
For primary bibliographic entry see Field 2H.
W74-04816

ECOLOGY AND BIOCOENOLOGY OF LAGUNAS OR LAKES OF THIRD ORDER OF THE TEMPERATE NEOTROPICAL REGION (SOUTHEAST PAMPASIC REGION OF ARGENTINA), (IN SPANISH),
La Plata Univ. (Argentina). Instituto de Limnologia.
For primary bibliographic entry see Field 2H.
W74-04817

RATIO OF ORGANIC CARBON WITH DIFFERENT TYPES OF OXIDIZABILITY IN THE OPEN WATER OF BAIKAL (IN RUSSIAN),
E. N. Tarasova.
Gidrobiol Zh. 8(5): p 70-75, Illus, 1972.
Identifiers: *Organic carbon, Seasonal, *USSR(Lake Baikal), *Oxidation.

The organic matter of Lake Baikal (USSR) was determined on the basis of the content of C and by means of oxidation of potassium bichromate in concentrated sulfuric acid and by potassium permanganate in an acidic medium. Data are given on the seasonal changes of the content of organic C, permanganate oxidizability in an acid medium, and bichromate oxidizability in the open waters of Baikal. The ratio of O2 of permanganate oxidizability to the O2 of bichromate oxidizability serves to some extent as a qualitative characteristic of organic matter.--Copyright 1973, Biological Abstracts, Inc.
W74-04819

5D. Waste Treatment Processes

MANAGEMENT OF STORMWATER RUNOFF IN SUBURBAN ENVIRONMENTS,
Engineering-Science, Inc., Cincinnati, Ohio.
G. D. Beers.
Available from National Technical Information Service as PB-228 010 $4.50 in paper copy, $1.45 in microfiche. Project Completion Report, November 1973. 111 p, 45 fig, 20 tab, 24 ref. C-2079(3395)(1).

Descriptors: Precipitation(Atmospheric), Model studies, *Management, *Urban runoff, *Storm runoff, Suburban areas, Urban hydrology, Cities, Urbanization, *Water demand, *Water reuse, Water quality, Attitudes.
Identifiers: *Suburban watersheds.

The overall objective was to assess the feasibility of managing surface runoff from various suburban watersheds to meet suburban water demands. Definitive results were not anticipated from this study but, rather, a first-cut definition of an essentially uncharted area in suburban hydrology would be constituted. Although it appears technically possible to incorporate stormwater runoff into the suburban water resources arsenal, a number of key areas require additional information before the overall feasibility can be ascertained. First, information is needed on the current status of suburban social attitudes towards the re-use of stormwater and all that it implies. Second, it seems reasonable to expect that certain modifications could be made to suburban watershed surfaces, and in man's use of them, with resultant higher quality runoff flows from these watersheds.
W74-04302

COLOR REMOVAL FROM TEXTILE DYE WASTE BY COAGULATION,
Auburn Univ., Ala. Dept. of Civil Engineering.
J. F. Judkins, Jr.
Available from National Technical Information Service as PB-228 635 $4.25 in paper copy, $1.45 in microfiche. Completion Report, June 30, 1970, 23 p, 9 tab, 9 ref. OWRR A-011-ALA(1).

Descriptors: *Waste water treatment, *Coagulation, Color, *Coagulants, Dyes, Textiles, Industrial wastes, *Sulfates, Biochemical oxygen demand.
Identifiers: *Color removal, *Textile dye wastes, *Alum coagulation, Ferric sulfate.

The purpose was to determine if color removal by coagulation could be made more economical by optimizing the coagulant dosage and pH range for the treatment of a waste. Two coagulants, ferric sulfate and aluminum sulfate were compared as to their relative costs and coagulating power for the treatment of sulfur and vat dye waste and of a mixture of vat and sulfur dye waste. The possibility of reducing the coagulant dosage by using a synthetic polymer as a coagulant aid was also investigated. In addition to color removal, reductions in BOD of the waste as a result of coagulation were studied. This research investigated color removal from concentrated dye waste samples only; samples were collected from a sewer which received the discharge from the dyeing machine at a local textile mill. The following conclusions were made: Coagulation with alum following pH adjustment was the most efficient of the methods investigated for removing color from sulfur dye waste. Hydrogen sulfide gas production becomes a problem in treating sulfur dye waste with pH values of 4.0 and below. The use of Separan coagulant aids is not justified. It is difficult to remove color from vat dye waste with any of the coagulants investigated. Ferric sulfate appears to be the coagulant of choice for treating 50% vat - 50% sulfur dye mixture if a final pH of 11.2 can be tolerated. Treatment of a 50% vat - 50% sulfur dye waste at pH 7.0 can be accomplished most economically with alum. Some BOD removal results from decolorizing dye waste.
W74-04303

SOCIAL, ECONOMIC, ENVIRONMENTAL, AND TECHNICAL FACTORS INFLUENCING WATER REUSE,
Utah Center for Water Resources Research, Logan.
A. B. Bishop, S. Pratishthananda, J. Keith, C. Colton, and A. B. Crawford.
Available from National Technical Information Service as PB-228 146 $3.25 in paper copy, $1.45 in microfiche. Utah Water Research Laboratory Publication PRJERO25-1, December 1973. 40 p, 13 fig, 3 tab, 147 ref. OWRR A-016-UTAH(1). 14-31-0001-3845.

Descriptors: *Reclaimed water, *Water reuse, *Recycling, *Impaired water use, *Social aspects, Social change, *Economic efficiency, Treatment, Legal aspects, *Environmental control.

The potential for wastewater salvage and reuse in a region is described in terms of the systems relations among the social and economic parameters affecting reuse of water and the environmental and technological aspects of wastewater disposal or salvage. Components of the hydrologic system are abstracted in network flow diagram which shows the water supply sources that are influent to water using activities (municipal, industrial, agricultural, fish and wildlife, and recreation) and the discharge of effluents from these activities. This framework is used to identify mechanisms--technological, economic, social, legal, and environmental--that will control or influence water reuse. Analyses include: (1) Technological--treatment and salvage/reuse technologies needed to upgrade water quality for reuse; recycling process water as related to places for application in the system, (2) Economic--influence of economic market mechanisms on reuse; implementation of various economic measures in promoting or discouraging reuse (e.g. incentive payments, taxes, penalties), (3) Social--assessment of attitudes, interests and norms of individuals and groups that affect reuse of water; sources of resistance to change and determination of social change necessary for acceptance of water reuse, (4) Legal--laws affecting the possibility of water reuse such as water rights, water management institutions, and water quality legislation, (5) Environmental--physical and biological considerations in the environment affecting reuse.
W74-04317

WATER SUPPLY AND WASTE DISPOSAL CONCEPTS APPLICABLE IN PERMAFROST REGIONS,
Alaska State Dept. of Environmental Conservation, Fairbanks.
A. J. Alter.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 577-581, 1973. 1 fig, 2 tab, 1 ref.

Descriptors: *Water supply, *Waste water disposal, *Waste water treatment, *Cold regions, *Arctic, Permafrost, Surveys, Conferences, Environmental engineering.

At permafrost and cold-dominated sites, water supply and waste disposal systems are especially subject to damage from freezing. Such damage may impair site, processes, and facilities. Several different concepts have been used to reduce the risk of damage. Current technology is adequate to insulate, heat, enclose, monitor, and otherwise provide protection. Dependability as well as costs for heat-sensitive systems present serious problems. Temperate climate concepts require input of heat energy. They are highly susceptible to failure under cold stress. Large imports of fuel to meet the energy needs of conventional systems are unrealistic on a long-term basis. Radical departure from current practice is indicated if costs are to be reduced significantly and dependability enhanced. Concepts that utilize low temperature or are unaffected by it should be investigated further. Imported energy must be conserved, and cold itself must be exploited as a resource to effectively and efficiently meet demand for water supply and waste disposal service and at the same time maintain environmental excellence on a long-term basis. (See also W74-04346) (Knapp-USGS)
W74-04405

A SEWAGE-TREATMENT CONCEPT FOR PERMAFROST AREAS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. C. Reed, and T. D. Buzzell.

In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 706-712, 1973. 1 fig, 2 tab, 10 ref.

Descriptors: *Sewage treatment, *Permafrost, Aeration, Waste treatment, *Waste water treatment, Water temperature, *Construction costs.

A sewage treatment concept was developed for permafrost areas. It is compatible with the permafrost environment and still offers substantial savings in construction costs. The concept adopts the passive approach to construction in permafrost by protecting the supporting material from thermal stress. The unit is designed to be placed above ground on a gravel pad with the tank slightly elevated on cribbing to permit free air flow underneath. This configuration protects the underlying permafrost from thermal degradation but exposes the tank bottom to the low winter temperatures. A number of protective features are included to prevent freezing of tank contents. The key element is utilization of a floating tube settler, which provides the essential final clarification of the effluent prior to discharge. The compact nature of this settler permits installation directly in the aeration tank, thus avoiding the need and costs for separate clarifier tankage. The resulting single-tank-treatment system provides significant thermal and economic advantages for utilization in the permafrost regions of the world. (See also W74-04346) (Knapp-USGS)
W74-04419

DISPOSAL OF RADIOACTIVE WASTES,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow.
V. I. Spitsyn, K. P. Zakharowa, L. D. Azamayeva, and N. V. Krylova.
Available from NTIS, Springfield, Va., as Rept. No. JPRS-58764. $4.00 per copy, $1.45 microfiche. Translation JPRS 58764, April 17, 1973. 71 p, 19 fig, 20 tab, 27 ref.

Descriptors: *Radioactive waste disposal, *Waste treatment, *Waste storage, Liquid, Solid wastes, Asphalt, Nuclear powerplants, Effluents, Economics, Air pollution, Water pollution, Geology, Hydrology, Sodium chloride, Technology, Management.
Identifiers: *Fuel reprocessing, *Water cooled reactors.

Five International Atomic Energy Agency (IAEA) papers dealt with the following topics: technical and economic aspects of handling liquid wastes with intermediate and high levels of radioactivity; the possibility of using bituminization for processing highly active wastes; a technical-economic comparison of the methods of solidification and tank storage for highly active liquid wastes from the processing of spent fuel elements of water-cooled water-moderated power reactors; scientific prerequisites for burying highly active liquid wastes in deep geological formations; and the development of methods for preparing the wastes from hexafluoride technology for burial. (Houser-ORNL)
W74-04445

INDUSTRY AWAITS SOLUTIONS TO PROBLEMS OF HIGH-LEVEL RADIOACTIVE-WASTE MANAGEMENT,
S. D. Strauss.
Issue available from POWER, McGraw, Hill, Inc., Pub., Concord, N.H., Single copy $2.00. Power, Vol 117, No 12, p 23-27, Dec. 1973. 12 fig.

Descriptors: *Radioactive waste disposal, *Nuclear powerplants, Effluents, Gas, Liquid, Air pollution, Water pollution, Water pollution sources, Treatment, Treatment facilities, Waste disposal, Geology, *Waste water treatment.
Identifiers: *Fuel reprocessing, *Waste storage, *Waste solidification, Salt disposal, Retrievable surface storage, Storage containers.

Long-term disposal of high-level radioactive wastes remains one of the unresolved aspects of the nuclear fuel cycle. Most likely possibility is storage in solid form in extremely stable geologic formations. Underground salt beds, under investigation for some time, appear likely to offer safe and stable storage for millions of years. Project Salt Vault, a 19-month study by Oak Ridge, was made to determine feasibility. Any of a number of salt deposits in U.S. can be used if the technique proves acceptable. One method of solidifying high-level liquid radioactive waste is by a calcining process that converts it into granular form, reducing volume approximately 90%. Solids are accumulated in storage bins. Since 1963, AEC has calcined its radioactive liquid high-level waste and stored it in bins 40-60 ft high x 12 ft in diameter, 7 bins to each underground concrete tank. The bins and tanks in this storage setup are designed to last at least 500 years. Temporary facilities, termed Retrievable Surface Storage, will be provided for high-level solid wastes from commercial reprocessing plants. AEC announced last year a program to design and construct a surface or near-surface facility, first module to be ready in time for receipt of the first shipments expected - some time in 1983-4. Others will be added as needed. (Houser-ORNL)
W74-04457

AN ASSESSMENT OF THE USE OF POTOMAC ESTUARY WATERS AND AWT EFFLUENTS FOR EMERGENCY WATER SUPPLY,
Meta Systems, Inc., Springfield, Va.
G. K. Young, and R. C. Palange.
Water Resources Research Center, Washington Technical Institute. Project Report No. 1. October 1973. 33 p, 5 tab, 34 ref.

Descriptors: *Water reuse, *Waste water treatment, *Water quality standards, Recycling, Water supply, Waste water, Disinfection, Toxicity, Public health, *Potomac River, *District of Columbia, Estuaries.
Identifiers: *Indirect reuse.

Recognizing the resistance to building upstream reservoirs for water supply for the Washington, D.C. area, this study looks at the alternative of waste water reuse including the use of the Potomac estuary. Previous experience with waste water reuse, professional and public opinion as to its acceptability, requirements and guidelines for domestic use of waste water, the health hazards involved, and the identification of operating procedures and precautions for processing waste water for reuse are examined. Examples of reuse include Chanute, Kansas, Santee, California, and Philadelphia. Most examples of reuse involve indirect reuse of waste water which includes natural processes in addition to treatment. Indirect reuse is more acceptable than direct reuse both in terms of public health requirements and public attitudes. Five basic issues are emphasized: disinfection of the waste water to remove viruses; the problem of long-term chronic toxicity; the reliability of the treatment processes, particularly waste water treatment; indirect reuse versus direct reuse; and public attitudes. Recommendations include: fail-safe procedures should be developed using an experimental pilot plant; an up-to-date inventory of industrial wastes should be made; investigate experiences of reuse in U.S., South Africa and U.S.S.R.; determine hydrodynamic and biologic attributes of Potomac estuary; develop criteria for limits for finished waters derived from waste water contaminated sources; and structure a public relations program. (Elfers-North Carolina)
W74-04506

SYRACUSE METROPOLITAN AREA COMPREHENSIVE PLAN-WATER AND SEWER PLAN AND SERVICES ALLOCATION PLAN,
Syracuse-Onondaga County Planning Agency, N.Y.
C. T. Ladd, and J. A. Martin.
Available from the National Technical Information Service as PB-219 042, $5.75 in paper copy, $1.45 in microfiche. Prepared for Central New York Regional Planning and Development Board, October 1972. 68 p, 1 map, 10 tab. NYP-246.

Descriptors: *Water supply, *Water demand, *Sewerage, *Utilities, *Comprehensive planning, Land use, Financing, Costs, Environmental effects, Coordination, Water quality, Inter-agency cooperation, Equity, *New York.
Identifiers: *Disparities, Utility extension, Syracuse(N.Y.), Equitable apportionment.

Several policies are recommended in this development plan which seeks to establish efficient and equitable water and sewer services. Environmental pollution would be alleviated by upgrading existing public works systems and by providing necessary facilities to already developed neighborhoods. Capacities of new public facilities should be designed to be incremental whenever possible. Additional population growth would be accommodated first within the existing and programmed sanitary districts. As optimal levels of development are approached, preparation for new demands within satellite systems would be made. The establishment of public sewer and water districts within preservation districts areas would be discouraged. Tax disparities should be eliminated for identical services, and the beneficiaries of new systems and facilities should pay their full share of development, operating, and maintenance costs. A coordinated capital improvements program for all local governments would be established. Scope of services, operation, administration and revenue sources of the present system, plus anticipated future needs are discussed. (Edwards-North Carolina)
W74-04507

PRATTVILLE, ALABAMA COMMUNITY DEVELOPMENT PLAN, VOL. II: SUMMARY AND ILLUSTRATIONS.
Central Alabama Regional Planning and Development Commission, Montgomery.
Report No. ALA-CAP-1415-1020-03. June 1973. 54 p, 42 fig, 3 tab. ALA-RX09-1020-0.

Descriptors: *Planning, *Water supply, *Sewerage, *Water demand, *Utilities, *Alabama, Financing, Costs, Water quality, Urban land use, Environmental effects, Drainage, Design, Timing, Scheduling, Investment.
Identifiers: Utility extension, Prattville(Ala), Urban growth, Alabama River.

Major features identified as a part of the Community Utility Plans are: all areas proposed for urban development to be serviced with public water and sewer; all extensions of water and sewer lines are planned to guide the location and density of development; water supply and pressure is to be designed for maximum domestic use plus maximum fire fighting needs; equity of distribution (supply and pressure) is to be achieved through minimum line diameter of 6 inches, through the locations of wells and storage facilities, and looping to reduce dead-end lines; sewer lines are designed for capacity growth utilizing a system of trunk lines and laterals; and drainage improvements are proposed to protect natural drainageways and to handle storm runoff from capacity development. Current estimates indicate the supply of water from wells will be sufficient to serve the future population. The sewer system in Prattville's most acute problem. Sewage treatment plant has inadequate capacity. Numerous breaks produce sewage flows into creeks. Relocation of the plant, construction of a second one, repair of lines, and installation of trunk lines to serve new development will all be necessary. Drainage is not a major problem, although some local improvements are needed. Steps should be taken to preserve natural drainageways. Erosion in some places has produced difficulties. Expenditures on community utilities are included in the proposed capital im-

provements budget for the period 1974 to 1980. (Edwards-North Carolina)
W74-04508

COMMUNITY WATER SUPPLY.
Agency for International Development, Washington, D.C. Office of the War on Hunger.
For primary bibliographic entry see Field 4B.
W74-04510

HOUSING AND PLANNING REFERENCES.
Department of Housing and Urban Development, Washington, D.C.
For primary bibliographic entry see Field 3D.
W74-04511

COLOR OF PULP INDUSTRY WASTE LIQUORS. III. THE INTERACTION OF CHLORO-OXYLIGNIN WITH METAL SALTS (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Faculty of Agriculture.
K. Sameshima, M. Sumimoto, and T. Kondo.
Mokuzai Gakkaishi (Journal of the Japan Wood Research Society), Vol 19, No 3, p 125-130, March 1973. 10 fig, 1 tab, 10 ref. English summary.

Descriptors: *Color, *Pulp wastes, *Bleaching wastes, *Waste water treatment, *Lignins, *Cations, Additives, Chemicals, Inorganic compounds, Nitrates, Water pollution sources, Waste treatment, Industrial wastes, Pulp and paper industry, Hydrogen ion concentration, Foreign research.
Identifiers: Chlorine compounds, Kraft mills, Chromophores, Thiolignin, Chlorolignin, Lignosulfonic acids, Japan.

Attempts to remove color from bleached kraft pulp mill effluents must focus on chlorinated oxidized lignin as the major chromophoric constituent in such wastes. Among 16 different metal nitrates examined for decoloring efficiency, trivalent cations were found to be superior to divalent ones and much superior to monovalent ones. The most effective cations were Fe(III), Al, Cr(III), and Pb(II). Since their action on chloro-oxylignin decreased greatly at alkaline pH, waste water treatments should preferably be conducted in the acidic range. Among different lignin-bearing wastes, oxylignin solutions were more readily decolored than lignosulfonic acid solutions, but slightly less readily than thiolignin solutions. (Brown-IPC)
W74-04512

ENVIRONMENTAL CHEMISTRY: AIR AND WATER POLLUTION,
Weber State Coll., Ogden, Utah. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W74-04513

ASPECTS OF COLOUR REMOVAL FROM PULP AND PAPER MILL EFFLUENTS,
Central Public Health Engineering Research Inst., Nagpur (India).
P. V. R. Subrahmanyam, P. C. Sachan, and G. J. Mohanrao.
IPPTA (Journal of the Indian Pulp and Paper Technical Association), Vol 9, No 1, p 20-23, January-March 1972. 2 tab, 12 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Lignins, *Color, Effluents, Soil chemical properties, *Ion exchange, *Cation adsorption, Adsorption, Waste water(Irrigation), Irrigation, Land use, Soil disposal fields, Filtration, Percolation.

Lignin is not only an esthetically offensive, but also a difficultly biodegradable pollutant. Effluent color caused by lignin can be removed by chemical methods, such as massive lime dosage, biological methods, such as activated sludge treatment and fungal degradation, and physical methods, such as adsorption on activated carbons or soils. Eight different soils were investigated for color-removing capacity. Laboratory results showed that color reduction was proportional to the cation-exchange capacity of the soils. The amount of land area required for pulp mill effluent treatment by this method is calculated, assuming steady percolation and evaporation rates. (Wise-IPC)
W74-04514

MECHANICAL CLARIFICATION OF INDUSTRIAL WASTE WATERS (MECHANISCHE KLAERUNG VON INDUSTRIEABWAESSERN).
Allgemeine Papier-Rundschau, No 46, p 1668, Nov. 20, 1972. 1 fig.

Descriptors: *Flotation, *Waste water treatment, *Pulp wastes, *Treatment facilities, Suspended solids, Fibers(Plant), Settling, Aeration, Activated sludge, *Industrial wastes, Pulp and paper industry, Effluents.
Identifiers: Krofta Sedifloat.

The 'Krofta Sedifloat' is a saveall developed primarily for the removal of fibers from paper and paperboard mill effluents. Its operation is based on the principle of flotation, rather than sedimentation. It is also suitable for the aftertreatment of aeration tank discharges containing activated sludge. Advantages of flotation over sedimentation as mechanical solids-removal methods are pointed out. (Brown-IPC)
W74-04515

MODERN WASTE WATER TREATMENT AND PROCESSING TECHNIQUES IN THE PAPER AND BOARD INDUSTRY (MODERNE ABWASSERAUFBEREITUNGS-UND VERFAHRENSTECHNIK IN DER PAPIER- UND KARTONINDUSTRIE),
Lurgi Apparate-Technik G.m.b.H., Frankfurt am Main (West Germany).
W. Schaper.
Das Papier, Vol 27, No 6, p 225-229, June 1973. 5 fig, 1 tab. English summary.

Descriptors: *Treatment facilities, *Pulp wastes, *Waste water treatment, *Equipment, Europe, Pulp and paper industry, Effluents, *Water quality standards, Biological treatment, Chemical precipitation, Coagulation, Flocculation, Sedimentation, Settling basins, Industrial wastes, Waste treatment.
Identifiers: *Germany, Biomat, Sedimat, Biosedimat.

Governmental regulations for environmental protection include waste water purification standards, for which a variety of treatments are available, including mechanical, chemical, and biological processes. German-made equipment for such treatments, suitable to the needs of the paper and paperboard industry, is illustrated, notably the design, construction, operation, and advantages of the 'Sedimat', 'Biomat', and 'Biosedimat'. (Wise-IPC)
W74-04517

WATER REUSE AND DEPOSITS CONTROL,
Buckman Labs., Inc., Memphis, Tenn.
S. J. Buckman.
Southern Pulp and Paper Manufacturer, Vol 36, No 4, p 17-20, 22, April 1973. 1 fig.

Descriptors: *Water reuse, *Pulp and paper industry, *Operation and maintenance, Equipment, Maintenance, *Corrosion, *Slime, Effluents, Industrial water, Water conservation, Water circulation, Instrumentation, Measurement, *Recycling.
Identifiers: Paper mills, Board mills, Downtime, Production losses, Mill management, Deposits(Scale and slime).

Although the recycling of process waters is the best approach to the reduction of effluent volumes in pulp and paper mills, increased reuse of water requires improved measures for controlling deposits of a microbiological nature, such as slime growths, and of nonbiological deposits, such as scales. The results of such deposits can be disastrous losses in production (due to machinery downtimes); losses in heat, fibrous and chemical raw materials, such as fillers; reduced life of paper machine felts and wires; and reduced product quality. A factory-wide deposits-control program should receive sustained attention from mill management. Practical evaluation and graphic presentation of results are part of the program, as are measuring instruments to obtain the data needed. The construction of a slime-measuring unit is illustrated. (Witt-IPC)
W74-04520

EFFECTS OF CONDENSATES ON THE TOXICITY OF KRAFT PULP MILL EFFLUENTS,
B.C. Research Ltd., Vancouver.
A. Bruynesteyn, and C. C. Walden.
Pulp and Ppaer Magazine of Canada, Vol 74, No 7, p 84-89 (Technical Paper T226), July 1973. 3 fig, 8 tab, 3 ref.

Descriptors: *Toxicity, *Pulp wastes, *Bleaching wastes, Effluents, *Resins, *Evaporators, Waste water(Pollution), *Water reuse, Water pollution sources, Evaporation, Pulp and paper industry, Industrial wastes.
Identifiers: Wash waters, Pulp washing, Kraft pulp, Condensates(Evaporator), Resin acids, Wood extractives, Kraft mills, Bleach plants, Washers(Equipment).

The reuse of evaporator condensates as wash water for brown stock (unbleached kraft pulp) was shown to increase the resin acid content of the washer effluent and its toxicity. Both drum and diffuser washers were evaluated. Although the wood species used in a pulp mill, as well as the carryover of adsorbed toxicants into the bleach plant, are factors in effluent toxicity, it should become possible to operate multiple-effect evaporators without producing toxic condensates. (Brown-IPC)
W74-04521

WILLAMETTE CLEANUP,
S. Pollitzer.
Pulp and Paper, Vol 47, No 3, p 51-55, March1973. 12 illus.

Descriptors: Water quality control, *Stream improvement, Rivers, *Oregon, *Pulp wastes, *Waste water treatment, Treatment facilities, Pulp and paper industry, Sulfite liquors, Industrial wastes, Waste treatment, Costs, Capital costs, Water quality standards, Law enforcement, Regulation, Fish, Recreation, Water sports, Biological treatment.
Identifiers: *Willamette River(Oregon), Sulfite mills, Chemical recovery, Spent sulfite liquors, Spent pulping liquors.

In 1972, the Willamette River (Oregon) became the first major U.S. waterway which received industrial wastes that had all undergone secondary treatment. This massive stream improvement effort involved 9 pulp and paper mills along the river and its tributaries. Although most of these mills possessed primary treatment facilities, they had to construct chemical recovery and secondary treatment systems totaling over $40 million. One sulfite mill closed down, another installed a chemical recovery system for ammonium-base spent sulfite liquor, and two mills converted to the magnesium-base sulfite pulping process. As a result of the total cleanup program, waste discharges into the river were reduced by 90%, the overall water quality was raised to meet strict federal and state standards, the number of migratory game fish was increased, and the sportive use of the water course

ws made safer and more enjoyable. A list of all mills affected by the program is included, detailing new effluent treatment facilities and their costs. (Witt-IPC)
W74-04522

A NEW SECONDARY TREATMENT.
Paper Trade Journal, Vol 157, No 19, p 46, May 7, 1973.

Descriptors: Biological treatment, *Waste water treatment, *Pulp wastes, *Biodegradation, *Treatment facilities, Equipment, Microorganisms, Pollutants, Oxidation, Industrial wastes, Waste treatment, Pulp and paper industry, Costs, Operating costs, Settling velocity, Sedimentation rates.

'Bio-Surf' is a pollution-control process developed by Autotrol Corp. that may reduce the costs of secondary waste treatment. The process was recently adapted to the needs of the pulp and paper industry. It utilizes a series of large plastic disks mounted and rotating on a horizontal shaft while partly immersed in the waste water. Biological growth forming on the disk surfaces performs natural oxidation of pollutants, producing carbon dioxide, water and additional microbial cells. The sludge produced has excellent settling properties. The system is said to adjust rapidly to changes in flow volume and pollutant concentration. (Witt-IPC)
W74-04524

EXTENSIVE EFFLUENT TREATMENT AT HODGE INCLUDES COLOR REMOVAL.
Paper Trade Journal, Vol 157, No 18, p39-40, April 30, 1973. 1 illus.

Descriptors: *Waste water treatment, *Louisiana, *Chemical precipitation, *Lime, *Color, *Pulp wastes, Sludge treatment, Sludge disposal, Incineration, Carbon dioxide, Calcium carbonate, Effluents, Pulp and paper industry, Air pollution, Hydrogen ion concentration, Dissolved solids, Suspended solids.
Identifiers: Chemical recovery, Lime kilns, Carbonation, Clarifiers, Flue gases, Hodge(La).

A novel feature of the environmental protection facilities at the recently expanded pulp and paper mill of Continental Can Co. in Hodge, La., is an effluent decoloring system, in which lime is added to the waste waters entering the first clarifier stage. Sludge from this primary clarifier, including precipitated color bodies, is incinerated in the mill's lime kiln for recovery of lime. Dissolved lime remaining in the clarified effluent is recovered by treatment with lime kiln stack gases which provide the carbon dioxide needed to precipitate dissolved lime as Ca carbonate. The pH of the clarifier effluent is adjusted before it enters the oxidation ponds for secondary treatment. Air pollution abatement facilities at the mill are also described. (Witt-IPC)
W74-04525

FINLAND STARTS PRODUCTION OF PROTEIN FROM BLACK LIQUOR.

Descriptors: *Pulp wastes, *Byproducts, *Proteins, *Waste treatment, Feeds, Carbohydrates, *Fermentation, Foreign research, Europe, Pulp and paper industry, Industrial wastes.
Identifiers: Pekilo protein, *Finland.

'Pekilo' protein is produced from the spent sulfite pulping liquor fermentation by fungi. The process is also applicable to the carbohydrate wastes of other industries. It can be licensed from SITV, a consortium of major Finnish pulp and paper companies. The product is an odorless cream-colored powder or granule which has undergone rigorous animal feeding tests. Initial production at United Paper Mills Ltd. in Jamsankoski will be ca. 10,000 tons in 1974. (McClenahan-IPC)
W74-04526

POLLUTANT REMOVAL HANDBOOK,
M. Sittig.
Noyes Data Corp., Park Ridge, New Jersey (and London, England) 1973. 528 p, Price: $36.00.

Descriptors: *Pollution abatement, Pollutants, *Chemicals, *Reviews, *Waste treatment, *Waste water treatment, *Air pollution, Water pollution treatment, Waste water(Pollution), Industrial wastes, Chemical industry, Pulp and paper industry, Effluents.

This compilation, based on a review of various cited literature sources, explains available techniques for the removal of chemical pollutants from water and air. About 130 different polluting chemicals are covered, ranging from acids to zinc, and including some materials found in pulp and paper mill effluents, such as chlorine, dyestuffs, flyash, formaldehyde, and sulfur dioxide. (Brown-IPC)
W74-04527

CLARIFICATION METHOD OF POLLUTED WATER FROM PAPER MILLS WITH COMBINATION OF BEER EFFLUENT (IN JAPANESE),
Washington Univ., Seattle. Coll. of Forest Resources.
K. Akagane, and G. G. Allan.
Japan Tappi, Vol 27, No 7, p 341-347, July 1973. 9 fig, 5 tab, 5 ref (English summary).

Descriptors: Water pollution sources, Water pollution treatment, *Pulp wastes, *Industrial wastes, *Food processing industry, *Waste water treatment, *Chemical precipitation, Settling velocity, Pulp and paper industry, Chemical industry, Proteins, Lignins, Phenols, Carbohydrates, Herbicides, Clays, Sulfonates.
Identifiers: *Breweries, Beer effluents, Alum(Aluminum potassium sulfate), Aluminum compounds, Hemicelluloses, Lignosulfonates, Alkali lignin.

The major components of paper mill effluents include hemicelluloses, fine fibers, and polyphenolic compounds, such as lignosulfonates and kraft (sulfate-process) lignin, whereas waste waters discharged by beer factories contain largely proteins. Joint treatment of paper mill plus beer factory wastes with 1% alum produced a large volume of precipitate, whereas this amount of alum had no effect on paper mill effluent alone. Settling of pollutants was accelerated by the presence of colloidal clay. The precipitated sediments might find commercial use as carriers for controlled-release herbicides. They could also be reused as paperboard filler. (Brown-IPC)
W74-04528

APPLICATION OF POLYACRYLAMIDE TO PULP MILL EFFLUENTS (IN JAPANESE),
Hokuetsu Paper Mills Co., Ltd., Nagaoka (Japan). Research Lab.
M. Sakuma, M. Kimura, and O. Takahashi.
Japan Tappi, Vol 27, No 6, p 283-288, June 1973. 10 fig, 3 tab, 5 ref. (English summary).

Descriptors: *Pulp wastes, *Bleaching wastes, *Waste water treatment, Sedimentation rates, *Coagulation, Suspended solids, Additives, *Chemcontrol, Hydrogen ion concentration, Polymers, Organic compounds, Inorganic compounds, Chemicals, Settling velocity, Industrial wastes, Pulp and paper industry, Waste treatment, Chemical oxygen demand, Surfactants.
Identifiers: Alum(Aluminum-potassium sulfate), *Polyacrylonitrile, Kraft mills, Molecular weight, Macromolecules, Coagulants, Aluminum compounds.

In the purification of effluents from bleached kraft pulp mills by addition of polyacrylamide (PAA) as a coagulant aid, studies were conducted on the appropriate alum dosage, the effects of PAA molecular weight and dose rate, and the effects of pH on coagulation efficiency. The removal of COD loading was found to depend on the alum dosage, but not on the PAA dosage. The function of PAA is seen in strong coagulation and rapid sedimentation of suspended solids. For satisfactory coagulation, the PAA preparation should have a molceular weight above 5 million. The settling rate increased with increased PAA dosage. Non-ionic PAA produced the fastest sedimentation at pH 5-7, whereas anionic PAA exerted the most rapid effect at pH 8, regardless of its degree of hydrolysis. (Brown-IPC)
W74-04529

LOW COST METHODS FOR TREATING PULP AND PAPER MILL EFFLUENTS,
Central Public Health Engineering Research Inst., Nagpur (India).
P. V. R. Subrahmanyam, R. C. Parekh, and G. J. Mohanrao.
IPPTA (Journal of the Indian Pulp and Paper Technical Association), Vol 9, No 1, p 14-19, January-March 1972. 6 fig, 2 tab, 18 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Water pollution treatment, *Pollution abatement, Pulp and paper industry, Oxidation, Biochemical oxygen demand, Aerated lagoons, Lagoons, Anaerobic digestion, Nutrients, Economic efficiency, Costs, *Operating costs.
Identifiers: *India.

The theory, mechanism, and suitability of four low-cost effluent treatment methods for application to pulp and paper mill discharges in India are discussed, namely, the oxidation pond, the oxidation ditch, and the aerated and anaerobic lagoon. Pilot-plant studies with nutrient addition to an anaerobic lagoon indicated BOD reductions for pulp mill effluents of 67% in summer and 50% in winter. Without nutrient addition, the same reductions required a doubling of retention time, but were considerably cheaper. Laboratory and pilot-plant studies with an aerated lagoon achieved BOD reductions of 15-20 mg per liter in 3 days. They indicated also that strong (highly polluted) wastes should be segregated and treated anaerobically in a preliminary stage. (Wise-IPC)
W74-04531

HYDROGEN PEROXIDE FOR INDUSTRIAL POLLUTION CONTROL,
FMC Corp., Princeton, N.J. Research and Development Dept.
W. H. Kibbel, Jr., C. W. Raleigh, and J. A. Shepherd.
Industrial Wastes, Vol 18, No 6, p 41-45, Nov/Dec 1972. 2 fig, 6 tab, 16 ref.

Descriptors: *Oxidation, *Oxides, Pollution abatement, *Sulfur compounds, *Industrial wastes, *Chemcontrol, Water pollution treatment, *Waste water treatment, *Phenols, Effluents, Chemical industry, Pulp and paper industry, Fuels, Textiles, Plastics, Sulfides, Inorganic compounds, Organic compounds, Chemicals.
Identifiers: *Cyanides, Hydrogen peroxide, Oxidants, Viscose rayon.

Among the commercial or commercially feasible applications of hydrogen peroxide in pollution control are the removal of sulfur compounds (such as sulfides, mercaptans, and sulfur dioxide) from waste products of the mining, fuel (coke, natural gas, and petroleum), viscose rayon, and kraft pulping industries; the detoxification of cyanides; and the elimination of phenolic compounds from effluent streams of the chemical and plastics industries. These and related applications are described. (Witt-IPC)
W74-04532

GRAVITY DEWATERING: APPLICATION TO PAPER MILL WASTES,
Permutit Co., Paramus, N.J.
W. L. Schwoyer.
Industrial Wastes, Vol 18, No 2, p 18-23, March/April 1972. 6 fig, 1 tab, 2 ref.

Descriptors: *Filters, *Dewatering, *Sludge treatment, Treatment facilities, Suspended solids, *Pulp wastes, *Filtration, *Waste water treatment, Operation and maintenance, Equipment, Fibers(Plant), Industrial wastes, Waste treatment, Pulp and paper industry, Particle shape, Particle size.
Identifiers: Concentrating(Dewatering), Gravity filters, Thickeners(Machinery), White water, Screw presses, Roller presses.

Mechanical gravity dewatering followed by secondary dewatering in a press is discussed as a means for concentrating paper mill effluents, such as white waters. Dewatering devices employing gravitational force require little power input and maintenance. They produce a clean filtrate, since small particles are not readily pulled from the inside of the forming filter cake. Gravity thickeners can also handle fragile and gelatinous particles without being clogged by them, and are operational over a wide range of influent solids concentrations. Several such thickeners are described. Chemical conditioning treatments for waste streams in order to reduce their drainage time are also discussed. Screw presses are used for secondary dewatering of sludges that contain long fibers, whereas multiroller presses are more suited for sludges relatively free of long fibers. (Witt-IPC)
W74-04533

PAPERMILL TREATMENT PLANT FOR SMALL INDUSTRY.
Industrial Wastes, Vol 18, No 2, p 16-17, March/April 1972. 2 fig.

Descriptors: *Pulp wastes, *Waste water treatment, Treatment facilities, *Coagulation, *Filtration, *Massachusetts, *Connecticut river, New England, Industrial wastes, Waste treatment, Pulp and paper industry, Mixing, Suspended solids, Sewage treatment, Water quality control, Pollution abatement, Effluents, Waste water(Pollution), Filters, Costs, Capital costs.
Identifiers: Microstrainers, Paper mills, Small enterprises.

Strathmore Paper Co. (West Springfield, Mass.) and Esleeck Manufacturing Co. (another paper mill in Turners Falls, Mass.) are jointly using a relatively economical waste treatment facility for removal of effluent suspended solids. The $850,000 project, built after a pilot-plant study, was partly funded by a federal grant and may point the way to survival of other small paper enterprises faced with 'stop pollution or shut down' orders. Effluents from the two mills are mixed, then treated jointly with a chemical coagulant, and passed through two 10-ft rotary microstrainers before being discharged into the Connecticut River. Solids retained by the strainers are pumped for further treatment to the City of Montague's municipal sewage system. (Witt-IPC)
W74-04534

BOISE CASCADE PAPER MILL AND ST. HELENS SHARE TREATMENT LAGOON.
Industrial Wastes, Vol 18, No 2, p 14-15, March/April 1972. 2 illus.

Descriptors: *Lagoons, *Waste water treatment, *Pulp wastes, Treatment facilities, *Sewage treatment, *Columbia River, *Oregon, Pulp and paper industry, Biochemical oxygen demand, Waste treatment, Industrial wastes, Waste water(Pollution), Aerated lagoons, Anaerobic digestion, Aeration, Pollution abatement, Pipelines.
Identifiers: Paper mills.

The pulp and paper mill of Boise Cascade Corp. at St. Helens, Oregon, recently started secondary treatment of waste waters in a new city-owned 40-acre holding lagoon. The jointly financed, aerobic-anaerobic (facultative) basin also serves for secondary treatment of the city's sewage. The $2.6 million facility can remove 85% of a daily BOD input of 55,000 lb before discharging treated wastes into the Columbia River through a concrete outfall pipe about 30 ft below the stream's summer water level. (Witt-IPC)
W74-04535

CATALYTIC OXIDATION AND THERMAL TREATMENT OF WASTE WATERS (KATALITICHESKOE OKISLENIE I TERMICHESKOE OBEZVREZHIVANIE STOCHNYKH VOD),
Gorkovskii Zavod Orgsintez (USSR).
S. P. Medvedev.
Gidroliznaya i Lesokhimicheskaya Promyshlennost', No 3, p 28-29, 1973. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial water, Cooling water, *Oxidation, Catalysts, *Chemical wastes, Treatment facilities, Pollution abatement, Waste water(Pollution), *Incineration, Burning, Chemical oxygen demand, Resins, Carbon dioxide, Steam, Evaporators, Organic loading, Inorganic compounds, Organic compounds, Chemicals, Chemical reactions, *Recycling.
Identifiers: Rosin, Turpentine, Silvichemicals, Naval stores, Furnaces, Chemical reactors, Lacquers, Camphor.

Effluents from the processing of pinewood oleoresin to obtain naval stores (rosin and turpentine), and from the conversion of turpentine into camphor, oxyterpene resins, and related silvichemicals, are heavily polluted and contain up to 70,000 mg of COD/liter. Rosin and camphor factory effluent (75% by volume) is less polluted, but waste waters from the manufacture of nitro lacquers (25% by volume) have COD values up to 128,000 mg/liter. Direct and indirect incineration of these effluents in a gas-fueled cyclone combustion chamber produces carbon dioxide and steam which are cooled from 900-100 to 150-250 C in a vertical furnace where they serve to heat evaporator steam and burner air. The heated steam is passed to a reactor where its organic content is oxidized in contact with a catalyst. The purified steam can be recycled. Mineral impurities melted in the burner are collected separately. Cooling water in the entire factory amount to 95-98% of its total freshwater consumption and is discharged without purification. Based on operating experience with the experimental effluent-treatment facilities, several suggestions for their improvement are presented. (Stapinski-IPC)
W74-04537

STUDY OF PULP AND PAPER INDUSTRY'S EFFLUENT TREATMENT.
EKONO, Helsinki (Finland).
Report prepared for United States Federal Agriculture Organization Advisory Committee on Pulp and Paper, 13th Session, Rome, 15-16 May 1972. 74 p, 23 tab, 43 fig, 47 ref.

Descriptors: *Pulp wastes, *Bleaching wastes, *Waste water treatment, Costs, Economic feasibility, *Treatment facilities, Economic efficiency, *Econometrics, Cost-benefit analysis, Pulp and paper industry, *Cost analysis, Waste treatment, Industrial wastes, Pollution abatement, Color, Lime, Biological treatment, Activated carbon, Adsorption, Sludge treatment, Sludge disposal, Water reuse, Water conservation, Regulation, Biochemical oxygen demand, Capital costs, Operating costs, Comparative costs, Suspended solids.
Identifiers: Kraft mills.

Estimates of engineering costs were prepared for liquid effluent treatments to meet various specified purification levels. Based on capital and operating cost data for six mill case histories, major findings were as follows: Treatment costs are directly related to water quality requirements and regulatory enforcement. Primary treatment costs depend on efficiency of settleable solids removal and ultimate sludge disposal. BOD as a water quality indicator also affects the secondary treatment cost which will double when desired BOD removal is raised from 85 to 90%. Tertiary treatment costs to remove 98% of 5-day BOD will be triple those for 85% removal. Kraft mill discharges can be decolored to 50 color units by massive lime treatment of bleach plant effluents plus adsorption of total effluents on activated carbon. Compared to 85% biological treatment, lime processing costs one-third; activated C about the same in capital but double in operating costs. As discharge regulations become more stringent, internal water conservation measures become more prevalent to reduce effluent volume through reduced freshwater intake. As much as 50% of treatment costs can be due to sludge disposal in mills providing 85% BOD removal plus sludge incineration. Major new developments aim at reducing pollutant discharges at their origin in the manufacturing flowchart. Minimization of treatment costs achievable by combined internal and external measures can vary with the final discharge objectives of any given mill. (Brown-IPC)
W74-04538

1972 REVIEW OF THE LITERATURE ON PULP AND PAPER EFFLUENT MANAGEMENT,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
G. Gove.
NCASI Stream Improvement Technical Bulletin, No 265, March 22, 1973. 66 p, 244 ref.

Descriptors: *Reviews, *Bibliographies, *Waste water treatment, *Pulp wastes, *Bleaching wastes, *Water quality control, Pulp and paper industry, United States, Byproducts, Recycling, Water reuse, Water conservation, Industrial wastes, Industrial water, Color, Flotation, Coagulation, Biological treatment, Suspended solids, Oxidation, Sludge treatment, Activated sludge, Aerated lagoons, Irrigation, Ultimate disposal, Soil disposal fields, Treatment facilities, Economics, Pollutant identification, Water pollution sources, Instrumentation, Water analysis, Recycling, Conferences, Personnel, Ion exchange, Membrane processes, Effluents, Waste water(Pollution), Municipal wastes, Solid wastes.

This annotated survey of publications on the U.S. paper industry's water quality control and waste treatment progress during 1971/1972 deals with the following topics: Pollutant sources and receiving waters; analytical procedures (biological studies and instrumentation); disposal and recovery of spent pulping liquors (including membrane and ion-exchange processes, and recovery of cooking chemicals and by-products); physicochemical treatments (waste water renovation and reuse, solids removal, color reduction, chemical coagulation, flotation, oxidation and stripping, sludge handling); secondary treatments (activated sludge, aerated stabilization basins, land irrigation, mill treatment facilities, pilot and laboratory studies); waste paper and municipal refuse recycling; and general matters, such as national policies, technical conferences, personnel, and treatment economics. (Witt-IPC)
W74-04540

MERCURY REMOVAL FROM WASTE WATER WITH STARCH XANTHATE-CATIONIC POLYMER COMPLEX,
Agricultural Research Service, Peoria, Ill. Northern Regional Research Lab.
C. L. Swanson, R. E. Wing, W. M. Doane, and C. R. Russell.
Environmental Scince and Technology, Vol 7, No 7, p 614-619, July 1973. 5 fig, 2 tab, 10 ref.

Descriptors: *Mercury, Pollution abatement, *Waste water treatment, *Flocculation, *Chemical precipitation, *Polymers, Polyelectrolytes, Carbohydrates, Addities, Colloids, Zeta potential, Pollutants, *Cation exchange.
Identifiers: *Starch derivatives, Xanthates.

The sequential addition of starch xanthate and of a cationic polymer, such as poly (vinylbenzyltrimethylammonium chloride) or polyethylenimine, to a solution of Hg(II) will precipitate both polymers and the Hg as a cohesive floc that can be readily filtered. Some xanthate groups on the C backbone of the starch macromolecule may form Hg(II) salts, while others react with the polycatin to form a polyelectrolyte complex. The amount of xanthate required to precipitate the Hg plus the cationic polymer can be determined by streaming current potential measurements. The effectiveness of Hg removal depends on the ratios of Hg to cationic polymer to xanthate. A single treatment reduced the Hg concentration in a solution from 100,000 to as little as 3.8 microgram per liter. (Witt-IPC)
W74-04541

ELECTROLYSIS AS A PURIFICATION METHOD FOR EFFLUENTS OF THE PULP AND PAPER INDUSTRY (DIE ELEKTROLYSE ALS REINIGUNGSVERFAHREN FUER ABWAESSER DER PAPIER- UND ZELLSTOFFINDUSTRIE),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
W. Brecht, and H-L. Dalpke.
Das Papier, Vol 27, No 5, p 165-181, May 1973. 11 fig, 4 tab, 20 ref (English summary).

Descriptors: *Electrolysis, *Waste water treatment, *Pulp wastes, *Pollution abatement, Biochemical oxygen demand, Chemical oxygen demand, Pulp and paper industry, Treatment facilities, Organic wastes, Organic loading, Dissolved solids, Waste treatment, Foreign research.

The theory of electrolysis is reviewed. Laboratory and industrial-scale experiments on the electrolytic purification of effluents from two paper mills are reported, with emphasis on the effect of dissolved organic material on BOD. Evaluation of all results indicated that electrolysis is presently limited to a partial reduction of waste water BOD and possibly of COD, but does not achieve further effluent purification. (Wise-IPC)
W74-04542

MILL'S WASTE WATER USED FOR SPRAY IRRIGATION.

Descriptors: *Soil disposal fields, *Water reuse, Sprays, *Waste water disposal, *Pulp wastes, *Michigan, Pulp and paper industry, Industrial wastes, Waste disposal, Effluents, Irrigation, Costs, Operating costs, Capital costs, Maintenance, Soil physical properties, Permeability, Spraying.
Identifiers: Paper mills.

A waste water spray irrigation system built by Chemco Inc. of St. Joseph, Michigan, has been installed on a 90-acre plot of Watervliet Paper Co. at an estimated project cost of $1 million. Construction, operating, and maintenance costs of the system are expected to be lower than for more conventional effluent disposal plants. Open land and a highly permeable soil are required. (McClenahan-IPC)
W74-04543

SOLAR ENERGY FOR THE CONCENTRATION OF PULP MILL EFFLUENTS,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Engineering.
B. W. Wilson.
Appita (Journal of the Australian and New Zealand Pulp and Paper Industry Technical Association), Vol 26, No 2, p 134-135, Sept. 1972. 4 ref.

Descriptors: *Pulp wastes, *Evaporation, *Solar radiation, *Solar distillation, *Waste water treatment, Ponding, Effluents, Waste treatment, *Australia, Pulp and paper industry, Weather.
Identifiers: Spent pulping liquors, Black liquors, Eucalyptus trees, Concentrating(Thickness).

Because weather conditions in many parts of Australia permit large volumes of surface waters to be evaporated by solar energy, the application of this energy source to the concentration of organic matter and inorganic chemicals in aqueous pulp industry effluents is suggested. In preliminary experiments, spent liquors from the pulping of eucalypts (by the kraft and neutral sulfite semichemical processes) were ponded and exposed for 90 days at Melbourne. Despite heavy rainstorms, extensive evaporation was noted. Rapid evaporation was also observed in laboratory studies, in which black liquors were exposed to infrared lamps (simulating solar energy). For industrial practice, partial solar evaporation might be followed and completed by conventional mill evaporators and ultimate incineration. (Wise-IPC)
W74-04544

PHYSICOCHEMICAL PROCESSES FOR WATER QUALITY CONTROL,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
W. J. Weber, Jr., J. A. Borchardt, R. P. Cavale, J. L. Cleasby, and J. E. Couver.
Wiley-Interscience, New York, N.Y. 1972. 640 p.

Descriptors: *Water quality control, *Waste water treatment, *Pollution abatement, *Engineering education, *Water resources development, Water chemistry, Treatment facilities, Coagulation, Flocculation, Chemical precipitation, Membrane processes, Filtration, Oxidation, Disinfection, Corrosion, Aeration, Sludge treatment, Sludge disposal, Ion exchange, Adsorption, Sedimentation.

In 12 chapters contributed by 9 experts this treatise develops rational foundations for the design, interpretation, implementation, and control of physicochemical processes (not merely unit operatins) for achieving or mediating quality tranformations in natural waters, water supplies, and municipal and industrial waste waters. The text evolved from courses taught at the University of Michigan to advanced undergraduate and graduate students in environmental and water resources engineering, chemical and mechanial engineering, and chemistry. It seems also suited as a reference and/or refresher volume for practicing engineers and scientists involved with quality control. The introductory chapter deals with process dynamics, mechanics of mass transport, reaction kinetics and equilibria, reactor engineering, and process design. Subsequent chapters discuss coagulation and flocculation, sedimentation, filtration, adsorption, ion exchange, membrane processes (reverse osmosis, ultrafiltration, electrodialysis), chemical oxidation (with oxygen, ozone, chlorine, permanganate, etc.), disinfection and disinfectants, corrosion and its control, aeration and gas transfer, and sludge treatment and disposal. Study problems (with approaches to solutions) and pertinent literature citations are given after each chapter. (Brown-IPC)
W74-04546

LIME DISINFECTION OF SEWAGE BACTERIA AT LOW TEMPERATURE.
Colorado State Univ., Fort Collins. Dept. of Microbiology.
S. M. Morrison, K. L. Martin, and D. E. Humble.
Copy available from GPO Sup Doc as EP1.23:660/2-73-017, $1.25; microfiche from NTIS as PB-228 545, $1.45. Environmental Protection Agency, Technology Service Report EPA-660/2-73-017, September 1973. 90 p, 33 fig, 18 tab, 81 ref. EPA Project 16100 PAK.

Descriptors: *Lime, *Sewage treatment, *Low temperature, *Sewage bacteria, *Disinfection, Calcium hydroxide, Alkali, Municipal wastes, Coliforms, Biochemical oxygen demand, Orthophosphate, Coagulation, Alaska, High altitude, Bioindicators, Hydrogen ion concentration, *Waste water treatment.
Identifiers: Excess lime treatment, Bacterial control.

Small isolated communities in cold climate areas need a simple, inexpensive, reliable sewage system which includes disinfection. This laboratory study provides clarifying data on the action of lime as a sewage disinfectant at low temperatures. Nutrient level reductions were also studied. Lime was added to raw and activated sludge treated sewage to attain pH intervals between 10 and 12 at temperatures of 1, 5, 10 and 15C. Membrane filter procedures were used to follow decreases in total and fecal coliform populations and total plate counts at each test pH and temperature. In both sewages, it was observed that pH values above 11 were required to reduce coliform populations to levels below 100/ml in less than 8-12 hours. To attain coliform population reductions to 1/ml or less, 24 hours were required at pH 11 but only 90 minutes at pH 11.5. Coliforms and other organisms concentrated in the precipitated solids during lime treatment; their numbers decreased as pH and/or contact time increased. Temperature was a less significant factor in the disinfection mechanisms than was pH. An additional effect of lime treatment of sewage is the reduction of organic and inorganic chemical loads in the effluent. The reductions at 15C for raw and 10C for secondary treated, measured by BOD and orthophosphate tests, reached maximum BOD removals of 77 and 94%, respectively, at PH 11 in 24 hours for raw and at pH 11.5 in 90 minutes for treated sewage. Likewise, maximum orthophasphate removals, 93 and 97%, respectively, were obtained at pH 12.0 for 60 minutes with raw and treated samples. (EPA)
W74-04548

WASTE AUTOMOTIVE LUBRICATING OIL AS A MUNICIPAL INCINERATOR FUEL,
GCA Corp., Bedford, Mass. GCA Technology Div.
Copy Available from GPO Sup Doc as EP1.23/2:73-293, $1.05; microfiche from NTIS as PB-228 601, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-293, September 1973. 74 p, 9 fig, 9 tab, 54 ref. EPA Project 15080 HBO, Contract 68-01-0186.

Descriptors: *Oil wastes, Industrial wastes, *Waste treatment, *Incineration, *Air pollution, Fuels.
Identifiers: *Refuse combustion, Heat flux.

The technical, economic and environmental impact of utilizing waste automotive lubricating oils to improve the municipal incineration combustion process was examined. Laboratory analyses of selected physical properties of waste oil and a waste oil burner testing program were conducted to complement an information search program. The physical and chemical properties of waste oil were reviewed in relation to its suitability as a fuel oil. The auxiliary fuel heat flux requirements to offset the adverse effects of wet refuse were estimated utilizing a combustion model of a refuse bed. Various methods were evaluated for transferring this required heat flux to the refuse bed. Suggested design for monitoring and control; and waste oil storage and feed systems were presented. The impact on air quality from the combustion of waste oil in a municipal incinerator was estimated. Three-month average ground level concentrations for lead were calculated and presented as concentration isopleths. Capital investment and

operating costs were developed for auxiliary waste oil systems in conjunction with municipal incinerators. (EPA)
W74-04549

EFFECT OF PHOSPHORUS REMOVAL PROCESSES ON ALGAL GROWTH,
California Univ., Irvine.
For primary bibliographic entry see Field 5C.
W74-04552

200 MGD ACTIVATED SLUDGE PLANT REMOVES PHOSPHORUS BY PICKLE LIQUOR,
Milwaukee Sewerage Commission, Wis.
R. D. Leary, L. A. Ernest, R. S. Powell, and R. M. Manthe.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-050, $1.50; microfiche from NTIS as PB-228 561 $1.45. Environmental Protection Agency Technology Series Report EPA-670/2-73-050, September 1973. 127p, 34 fig, 9 tab, 39 ref. EPA Project 11010 FLQ.

Descriptors: *Activated sludge, *Biological treatment, Chemical precipitation, *Iron, Phosphorus, *Wisconsin, *Waste water treatment, Sulfates.
Identifiers: *Phosphorus removal, Milwaukee(Wis), *Pickle liquor, Ferrous sulfate.

The Milwaukee Sewerage Commission's Jones Island Waste Water Treatment Plant consists of a mutual primary treatment facility followed by two separate activated sludge plants. To enhance phosphorus removal in the 115 MGD East Plant, hot spent sulfuric acid pickle liquor (ferrous sulfate) was added for a one year test period in 1970 while the 85 MGD West Plant was operated as a control. This follow up report covers the 1971 operational period in detail and the first four months in 1972. An average of 8.0 mg, Fe/l of pickel liquor iron (8436 lbs. Fe/day) was added in 1971 to the East Plant mixed liquor, producing an effluent total phosphorus concentration of 0.69 mg P/l and a total soluble phosphorus concentration of 0.15 mg P/l. This performance is based upon a raw screen sewage total and total soluble phosphorus concentration of 7.1 and 2.3 mg P/l, respectively. In an attempt to enhance phosphorus removal in the West Plant, East Plant waste sludge containing a higher iron content was added to the West Plant return sludge starting in April 1971. This procedure increased the iron content of the West Plant but did not substantially increase the West Plant phosphorus removal. During the 12 month period from May 1971 to April 1972, the West Plant effluent total and total soluble phosphorus concentrations averaged 1.5 and 0.64 mg P/l, respectively. (EPA)
W74-04554

ALLOCATION OF FUNDING FOR WASTEWATER TREATMENT FACILITIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. S. Hunter, III.
Journal Water Pollution Control Federation, Vol 46, No 1, p 18-27, January 1974. 3 fig, 17 ref.

Descriptors: *Water pollution control, *Waste water treatment, *Treatment facilities, *Cost-benefit analysis, *Project benefits, *Systems analysis, Mathematical models, Administration, Optimization, Estimating, Evaluation, Welfare(Economics).
Identifiers: *Funding(Allocation).

Priority systems developed by state administrative authorities to allocate federal wastewater treatment plant construction grant funds contain deficiencies and have been ineffective in directing this money to the most beneficial projects. A benefit-cost ratio approach to fund allocation is preposed that overcomes many of the shortcomings of current procedures. Systems analysis techniques are presented that can be used to obtain the necessary full and flexible consideration of all possible alternative funding combinations. Of particular interest is the development of a benefit estimation technique which can be used for evaluating water pollution control projects. The technique can be considered an optimization procedure, in this case for finding the mix of treatment facilities that maximizes benefits within a given budget constraint. Interdependencies among the four dimensions of the water resource (time, quantity, location, and quality) and the various uses to which the water resource can be put are taken into account. More attention must be given to the actual benefits obtained from water quality management projects. (Bell-Cornell)
W74-04562

WATER QUALITY IMPROVEMENT IN RIVER BASINS (EXPERIENCE OF INDUSTRIALIZED COUNTIRES) (O POVYSHENII KACHESTVA VODY V RECHNYKH BASSEYNAKH (OPYT INDUSTRIAL'NYKH STRAN)),
For primary bibliographic entry see Field 5G.
W74-04583

WHAT'S WRONG WITH GOVERNMENT WATER CONTROL PROGRAMS AND HOW THEY CAN BE IMPROVED,
Georgia Coll., Milledgeville. Dept. of Business Administration and Economics.
R. M. Piper.
Paper Trade Journal, Vol 157, No 12, p 31-33, March 19, 1973. 2 tab.

Descriptors: *Pulp and paper industry, *United States, Surveys, *Federal government, *Water quality control, *Legal aspects, *Regulation, Water policy, Project planning, Economics, Capital costs, Waste water treatment, Biological treatment, Ecology, Economic prediction, *Water quality standards, Administration, Pollution abatement, Planning, Research priorities.
Identifiers: Incentives, Economic incentives.

An opinion survey of the U.S. paper industry regarding water quality legislation was conducted in 1971. Results indicated that the percentage of industry effluents receiving secondary treatment would rise from 16% in 1965 to 96% in 1975, and that industrial expenditures for pollution abatement facilities would increase from 6% of total plant and equipment investments in 1965 to ca. 18% in 1975. Reported discontent with governmental water control programs is discussed in the areas of water quality standards, intergovernmental relations, environmental planning, and economic problems. Suggestions for existing program improvement (rather than for new legislation) are made in the sectors of environment planning water standards, economic incentives and research needs. A better balance between ecological goals and economic sacrifices is urged. (Witt-IPC)
W74-04632

HYPOCHLORINATION OF POLLUTED STORM-WATER PUMPAGE AT NEW ORLEANS,
Pavia-Byrne Engineering Corp., New Orleans, La.
U. R. Pontius, E. H. Pavia, and D. G. Crowder.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-067, $1.95; microfiche from NTIS as PB-228 581, $1.45. Environmental Protection Agency, Technology Series Report, EPA-670/2-73-067, September 1973. 188 p, 53 fig, 23 tab, 33 ref. EPA Project 11023 FAS.

Descriptors: *Disinfection, *Chlorination, *Water pollution treatment, *Treatment facilities, *Storm runoff, Coliforms, Operation and maintenance, Plastic pipes, Oxidation-reduction potentials, Centrifugal pumps, Concrete lined canals, Protection coatings, Sodium compounds, Storage tanks, *Louisiana, *Waste water treatment.
Identifiers: *Hypochlorination, Sodium hypochlorite manufacturing facilities, Lined steel storage tanks, New Orleans, Hypochlorite feeding facilities, Residual chlorine analyzers.

Storm water from the streets of New Orleans flows to large drainage pumping stations where it is discharged into lake Pontchartrain by means of long outfall canals. To reduce the coliform density, storm water was disinfected with sodium hypochlorite (NaOCl). Project facilities included manufacture, transportation, storage and feeding of 100 gram/l NaOCl. Residual chlorine analyzers were used to monitor NaOCl dosage levels. Sixteen high volume storms totaling 10 to the 9th power gal. of storm water were treated with more than 35,000 gal. of NaOCl. Total and fecal coliform in untreated storm water exceeded 1000 org/100 ml, 99% of the time. Coliform densities in treated water were significantly reduced, with chlorine residuals (total available) of greater than 0.5 mg/l resulting in 99.99% or greater removal. However, rapid recovery of coliform levels occurred within 24 hours. Total coliform recovered to pre-disinfection levels, but fecals did not. The recovery did not appear to be the result of tidal influences. Long term fecal coliform levels were reduced by one order of magnitude in each outfall canal. The amortized cost of NaOCl manufacturing, transporting, feeding and control facilities was $53,600/yr. NaOCl costs for treating 5 times 10 to the 10th power gal. of storm water yearly were $200,300. This resulted in a treatment cost of $.000051/gal. (EPA)
W74-04676

SURVEY OF FACILITIES USING LAND APPLICATION OF WASTEWATER,
American Public Works Association, Chicago, Ill.
R. H. Sullivan, M. M. Cohn, and S. S. Baxter.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402 Price $6.80. Environmental Protection Agency, Office of Water Program Operations, Report EPA-430/9-73-006, July 1973, 377 p, 23 fig, 98 tab, 114 ref.

Descriptors: *Water reuse, *Land management, *Treatment facilities, Surveys, *Water spreading, Waste disposal, *Waste water disposal, Domestic wastes, Industrial wastes, *Waste water treatment, Tertiary treatment, Land use, Zoning, Monitoring, Water pollution, Soil types.
Identifiers: *Land application(Waste water), *Spray irrigation, Waste water transport.

A field survey was made of 100 major facilities where land applications of domestic or industrial wastewater effluents were utilized; agricultural wastes facilities and evaporation-percolation or spray runoff type facilities were not investigated. Land application systems are generally used seven days per week; application rates for crop irrigation are generally about two inches per week (54,300 gallons per acre per week). Sand, loam and silt were the most common soil types. Industries generally treat their total waste flow by land application; municipalities varied from less than 25 percent to all of the wastewaters discharged. Secondary treatment, generally lagooning, is provided by municipalities prior to land application; industries frequently treat their process wastes by screening only. Spray irrigation is the most frequently used method of application (57 facilities) mainly by industries. Ridge and furrow irrigation is used at 23 facilities and flooding irrigation by 34 systems. Land use zoning for land application sites is predominantly classified as farming, with some residential zoning in contiguous areas. Wastewater generally is transported to the application site by pressure lines, although some municipalities utilize ditches or gravity flow pipe lines. More than half of the community land application facilities have been in use for more than 15 years; industrial systems for a lesser period of time. Renovated wastewater is seldom collected by underdrains; rather, evaporation, plant trans-

piration, and groundwater recharge take up the flow. Monitoring of groundwater quality, soil contaminants, crop uptake, and surface water is not carried out with any consistency.
W74-04677

PROCESSES FOR REDUCING THE ORGANIC-CARBON CONTENT OF WATER CONTAMINATED WITH ORGANIC COMPOUNDS BY CONTINUOUS COUNTERCURRENT MULTISTAGE TREATMENT WITH ACTIVATED CARBON,
Environmental Protection Agency, Washington, D.C. (Assignee).
W. G. Timpe, and E. W. Lang.
U.S. Patent No. 3,763,040, 5 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 915, No 1, p 274, October 2, 1973.

Descriptors: *Patents, *Waste water treatment, *Organic compounds, *Activated carbon, *Pulp wastes, Pulp and paper industry, *Industrial wastes, Pollution abatement, Water pollution control, Water quality control.

The process for reducing the organic-carbon content of contaminated water comprises subjecting the water to a continuous countercurrent multistage treatment with particulate activated carbon in several tanks. A high slurry density is maintained in each tank. The slurry is stirred continuously and portions free of solid particles are withdrawn and transferred into a consecutive tank of the series. The activated carbon particles have sizes between 104 and 250 microns. Fresh activated carbon particles are continuously charged into the last of the series of tanks or stages at a dosage or rate such that the total organic-carbon content of the incoming contaminated water is reduced to the preselected value. The spent carbon particles are withdrawn from the first of the tanks or stages in series at substantially the same rate as fresh activated carbon is charged to the last tank or stage. The tanks or stages are connected in such manner that the water can flow or be charged continuously from the first to the last tank or stage of the series and portions of the water containing dispersed carbon particles that are undergoing treatment in each of the tanks or stages can be withdrawn and charged countercurrently to the flow of the water from each tank to a preceding tank or stage in the series. Each tank or stage is provided with screens or baffles which create a clarification zone that retains or holds back carbon or other solid particles that are dispersed in the slurry and permits the treated water to flow out of the tank or stage to the next, or out of the last tank or stage, as a clear liquid essentially free of suspended carbon or other solid particles. (Sinha-OEIS)
W74-04704

WATER PURIFICATION,
For primary bibliographic entry see Field 5F.
W74-04706

APPARATUS FOR TREATING INDUSTRIAL AND DOMESTIC WASTE WATERS,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
A. B. Turner.
U.S. Patent No. 3,774,768, 5 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 916, No 4, p 1360, November 27, 1973.

Descriptors: *Patents, *Biochemical Oxygen Demand, *Industrial wastes, *Domestic wastes, *Waste water treatment, *Oxygenation, Pollution abatement, Water quality control, Water pollution control.

A system is described for removing BOD from waste water. A single containment structure incorporates a surge aeration tank and a system for transferring oxygen to a liquid which is circulated through a contact section to establish contact of the oxygen containing gas-suspended solids--liquid mixture. The structure maximizes the oxygen utilization within the system while simultaneously generating small air bubbles to achieve great efficiency and rapid removal of the BOD. The system for treating waste waters includes a pair of concentric tanks forming a space which serves as an aeration chamber. Untreated but screened waste water is discharged into the space and withdrawn from it by a pump which passes the liquid through an oxygenating device which induces air into the liquid. The liquid is then circulated through long tubing wound around the outside peripheral surface of the tank to obtain intimate contact between the gas, liquid and solids therein and to convert dissolved material into insoluble material by a conventional biochemical process. The liquid thus processed in the tubing is introduced into the central or inner tank where the treated solids rise to the surface for recycling in the system while the liquid effluent is filtered and discharged to a river or stream. (Sinha-OEIS)
W74-04707

SEDIMENTATION TANKS,
British Wedge Wire Co. Ltd., Warrington (England), (Assignee).
V. Sparham, and G. F. Pinner.
U.S. Patent No. 3,774,770, 5 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 916, No 4, p 1361, November 27, 1973.

Descriptors: *Patents, *Waste water treatment, *Sedimentation, Equipment, *Filtration, Pollution abatement, Water pollution control, Water quality control.
Identifiers: *Settling tanks.

A sedimentation tank for liquid purification has a submerged horizontal filtering screen for purifying liquid passing upward through it and a scraping mechanism for scraping sludge from the bottom of the tank towards a sludge outlet. The filtering screen extends across the greater part of the interior of the tank, the zone above it being partitioned from an adjoining zone through which extends downwardly a transmission element drivably connecting the scraping mechanism to an outside power source. (Sinha-OEIS)
W74-04708

METHOD AND APPARATUS FOR THE BIOLOGICAL TREATMENT OF WASTE WATER,
Autotrol Corp., Milwaukee. Wis. Bio-Systems Div. (Assignee).
W. N. Torpey.
U.S. Patent No. 3,776,841, 4 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 917, No 1, p 286, December 4, 1973.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, Suspended solids, Pollution abatement, Water pollution control, Water quality control.
Identifiers: Settling, *Carbonaceous wastes.

Forcibly rotating bodies that are partially submerged in waste water provide surface area on which biological slimes develop and serve the purpose of removing pollutants from the waste water. The rotating, partially submerged bodies are located in the upper portion of the treatment tanks, to provide a biological treatment zone. A subjacent settling zone, physically separated from the biological treatment zone by a 'false bottom' or longitudinal baffle is provided in the lower portion of the treatment tank. Waste water introduced in the tank is first biologically treated and then circulated through the subjacent settling zone to remove settleable solids. Virtually all, usually 100% of the biologically treated waste water is forced through the subjacent settling zone which, because of its physical separation from the rotating contactors is quiesent and capable of a high removal of suspended solids. The improved apparatus and method result in a consistent removal of carbonaceous pollutants from the waste water with a minimum spillover of suspended solids thereby eleiminating the neef for subsequent solids removal apparatus. (Sinha-OEIS)
W74-04709

SCREENING AERATOR CONCENTRATOR,
Sweco, Inc., Los Angeles, Calif. (Assignee).
P. H. Mook, and T. R. Westfall.
U.S. Patent No. 3,775,311, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 916, No 4, p 1493, November 27, 1973.

Descriptors: *Patents, *Waste water treatment, *Aeration, *Aerators, Equipment, *Froth flotation, Pollution abatement, Water pollution control, Water quality control.

The apparatus comprises a fine mesh rotating screening aerator combined with a froth flotation system. Although the rotating screen separator by its very nature creates a certain amount of froth, this frothing ability can be enhanced by this invention which adapts such separators to make use of their aerating capability. The frothing potential may be enhanced by various methods. One is to introduce a stream of air into the influent just before it passes into the rotating screen separator. Another is to add a series of vanes on the rotating screen cage to increase air circulation. Such methods of adding air, or ensuring an adequate supply of air into the apparatus, enable an increase in the dissolved oxygen which enhances the life-sustaining and aerobic digestion qualities of the effluent. (Sinha-OEIS)
W74-04712

METHOD AND APPARATUS FOR TREATING EFFLUENT,
Mono Pumps (Engineering) Ltd., London (England). (Assignee).
A. P. Hopwood.
U.S. Patent No. 3,773,660, 3 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 916, No 3, p 1051, November 20, 1973.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Equipment, *Pollution abatement, *Water pollution control, *Water quality control.

A method of treating raw sewage consists of the steps of macerating the effluent, passing it to a vessel containing submerged contact media and passing air through the vessel and the effluent is fed into the lower region of the vessel. Biologically purified effluent can leave the top of the vessel and pass to a suitable settlement tank and the sludge can be separated for treatment in a sludge treatment vessel. The effluent from the settlement tank can be passed to at least one more stage wherein the above steps, with the exception of maceration, are repeated. The effluent can, alternatively, be passed from the first vessel to a second vessel and then to a settlement tank. (Sinha-OEIS)
W74-04714

PROCESS FOR PURIFYING WATER THAT CONTAINS ORGANIC MATTER,
Kurita Water Industries Ltd., Osaka (Japan). (Assignee).
Y. Misaka, M. Kuriyama, and T. Mukai.
U.S. Patent No. 3,763,038, 5 p, 1 fig, 9 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 915, No 1, p 273, October 2, 1973.

Descriptors: *Patents, Pollution abatement, *Waste water treatment, *Organic matter, *Flocculation, *Coagulation, Microorganisms, Iron, *Aeration, Water purification, Sedimentation.
Identifiers: Ferric salts, Ferrous salts, Oxidants.

The process comprises a series of treatment steps of mixing coagulants consisting of either a ferric salt alone or a ferrous salt and an oxidant into the sewage. The sewage is agitated to stimulate floc formation and growth. In a sedimentation section separation of effluent and sludge takes place. The effluent is introduced into an aeration tank where iron floc is formed and the microorganisms are adsorbed on the flocs. (Sinha-OEIS)
W74-04716

METHOD OF TREATING SEWAGE USING HIGH POLYMER RATIO FLOCCULATION AGENT BIOLOGICALLY PRODUCED IN SITU,
Houdaille Industries, Inc., Buffalo, N.Y. (Assignee).
G. E. Wilson.
U.S. Patent No. 3,763,039, 12 p, 9 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 915, No. 1 p 273, October 2, 1973.

Descriptors: *Patents, Polymers, Microorganisms, *Flocculation, *Suspended solids, *Sewage treatment, *Activated sludge, Pollution abatement, *Waste water treatment, Water quality control, Water pollution control.

A high polymer ratio flocculation agent is introduced into raw sewage to remove colloidal suspended solids in the primary clarifier of a sewage treatment plant. The flocculation agent comprises at least 10 percent by dry weight biologically derived polymeric material and can be derived in situ from microorganisms that are commonly found in an activated sludge process. The flocculation agent is produced by subjecting microorganisms capable of generating polymeric material to a high flood content environment in an aeration tank into which supernatant from the primary clarifier is delivered and then subjecting the microorganisms to a low food content environment, as a consequence of which polymeric material is generated through the extracellular activity of the microorganisms. (Sinha-OEIS)
W74-04717

APPARATUS FOR TREATING WASTE FLUIDS BY MEANS OF DISSOLVED GASES,
Pollution Control Engineering, Inc., Downey, Calif. (Assignee).
G. E. Hurst.
U.S. Patent No. 3,773,179, 4 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 916, No 3, p 932, November 20, 1973.

Descriptors: *Patents, Flotation, Gases, *Waste water treatment, *Pollution abatement, *Water pollution control, *Water quality control.
Identifiers: *Dissolved gases.

Water to be treated is pumped a number of times from different compartments of a floatation tank. The flow of water can be relatively smaller and at each pumping operation more gas can be injected into the flow so that more gas is forced into solution than could be obtained with a large flow through a single pump. The discharge into each tank compartment is confined to a relatively small area as well and then is discharged against a deflector plate which actually scrubs the oil or suspended matter out of the waste water. The oil or suspended matter which is caused to float in each compartment is then removed from the surface either by a continuous belt skimmer, by passing it over a weir or using a moving skimmer arm and the clarified water is removed from the bottom of the final compartment. In the first compartment fluid is withdrawn, gas is injected into the flow, and then it is returned to the same compartment and discharged against a deflector plate. A second pump takes fluid from the first compartment and discharges it into the second compartment and a third pump takes fluid from the second compartment and discharges it into the third compartment. At the point of gas injection, flocculent materials can also be introduced if necessary. (Sinha-OEIS)
W74-04719

TRICKLING FILTER-ACTIVATED SLUDGE COMBINATIONS FOR DOMESTIC WASTE-WATER TREATMENT,
Rieke, Carrol, Muller Associates, Inc., Hopkins, Minn.
R. F. Roskopf, J. C. Young, and E. R. Baumann.
Available from NTIS, Springfield, Va. 22151 PB-221 090 for $3.00 printed copy; $1.45 microfiche. Iowa State University Engineering Research Institute Special Report 73107, May 1973. 203 p, 42 fig, 7 tab, 89 ref, 3 append.

Descriptors: *Waste water treatment, *Trickling filters, *Iowa, Sewage treatment, Activated sludge, Municipal wastes, *Sludge treatment.
Identifiers: *Ames(Iowa).

The feasibility of using a new activated sludge process in series or parallel with an existing trickling filter was studied as a means of upgrading and/or expanding the capacity of a domestic wastewater treatment plant. Typical domestic wastewater (Ames, Iowa primary settling tank effluent) was used throughout the study as pilot plant influent. Both biological pilot units performed typically when used as first-stage units. Pilot trickling filter performance was essentially the same as that of the Ames trickling filters. Second-stage unit performance was dependent upon first-stage performance, and warm weather nitrification was obtained with the TF-A process. All three combinations had potential for economically providing a high quality final effluent, although both series processes seemed to have performance advantages over the parallel process. With approximately equal volumes of aeration tank and trickling filter, the overall performance of each series combination was essentially equal to or greater than the performance of an equally loaded activated sludge process. The parallel process provided a greater overall performance than could be obtained by combining the effluents from parallel but separate activated sludge and trickling filter plants. The existing Ames plant could be economically upgraded and expanded with a series TF-A process having the flexibility of parallel operation when so desired. (Knapp-USGS)
W74-04798

OZONIZATION AS A METHOD OF PURIFYING WATER POLLUTED WITH CHEMICAL COMPOSITION, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
A. A. Korolev.
Gig Sanit. 37(12): p 78-83. 1972.
Identifiers: Chemical compounds, *Ozonization, Polluted waters, *Water purification, *Public health, *Waste water treatment.

The use of ozone for purifying water and industrial waste polluted with chemical compounds should be studied constantly by hygienists. Investigators have concentrated on an evaluation of the quantitative aspect of the problem of ozonization (the degree of decomposition of various substances, the magnitude of the bactericidal effect, etc.). The qualitative biological aspect of ozonization was not reported. The need for such investigations was dictated by the increasing use of ozone for water treatment and waste purification.--Copyright 1973, Biological Abstracts, Inc.
W74-04836

5E. Ultimate Disposal Of Wastes

WATER SUPPLY AND WASTE DISPOSAL CONCEPTS APPLICABLE IN PERMAFROST REGIONS,
Alaska State Dept. of Environmental Conservation, Fairbanks.
For primary bibliographic entry see Field 5D.
W74-04405

A HISTORY AND PRELIMINARY INVENTORY REPORT ON THE KENTUCKY RADIOACTIVE WASTE DISPOSAL SITE,
Kentucky Dept. of Health, Frankfort. Radiological Health Program.
For primary bibliographic entry see Field 5B.
W74-04442

DISPOSAL OF RADIOACTIVE WASTES,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow.
For primary bibliographic entry see Field 5D.
W74-04445

INDUSTRY AWAITS SOLUTIONS TO PROBLEMS OF HIGH-LEVEL RADIOACTIVE-WASTE MANAGEMENT,
For primary bibliographic entry see Field 5D.
W74-04457

LAND DISPOSAL OF WASTE GASES: 1. FLOW ANALYSIS OF GAS INJECTION SYSTEMS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
S. Miyamoto, A. W. Warrick, and H. L. Bohn.
Journal of Environmental Quality, Vol 3, No 1, p 49-55, January-March 1974. 8 fig, 2 tab, 17 ref.

Descriptors: *Waste disposal, *Soil disposal fields, *Gases, Permeability, Soil chemical properties, Soil physical properties, Diffusion, Seepage.
Identifiers: *Waste gas disposal, Air pollution control.

The steady-state flow of gases in soils was analyzed mathematically from the view of land disposal of waste gases. Gas injection systems considered include ditches, buried pipes, and wells. The systems are compared on the basis of two criteria: how effectively the power is used (power efficiency); and how uniformly the gas is distributed through soils (uniformity). Often the two criteria are in conflict, and systems giving a high power efficiency result in low uniformity. Gas injection by buried porous pipe appears advantageous over ditch or well systems. (See also W74-04480) (Knapp-USGS)
W74-04479

LAND DISPOSAL OF WASTE GASES: II. GAS FLOW FROM BURIED PIPES,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
A. W. Warrick, and S. Miyamoto.
Journal of Environmental Quality, Vol 3, No 1, p 55-60, January-March 1974. 8 fig, 1 tab, 5 ref.

Descriptors: *Waste disposal, *Soil disposal fields, *Gases, Permeability, Soil chemical properties, Soil physical properties, Diffusion, Seepage.
Identifiers: *Waste gas disposal, Air pollution control.

Steady-state compressible gas flow in homogeneous soils from buried porous pipes was analyzed for the purpose of developing land disposal systems for waste gases. Two different cases are considered: the ground surface partially covered by an impermeable barrier; and the surface corrugated with alternating ridges and valleys with the pipe buried under the ridges. The partial surface barrier provides a more uniform gas flow in soils than without it, but leads to an increase in the power required to inject gas at a given rate, expecially when the pipe spacings are wide. Compared to an open level surface, the corrugated geometry results in a better gas distribution with little increase in power required and is probably the better system for injecting waste gas in nonstratified soils. (See also W74-04479) (Knapp-USGS)
W74-04480

PAPER MILL SLUDGE DISPOSAL ON SOILS: EFFECTS ON THE YIELD AND MINERAL NUTRITION OF OATS (AVENA SATIVAL.),
Wisconsin Univ., Madison. Coll. of Agricultural and Life Sciences.
S. G. Dolar, J. R. Boyle, and D. R. Keeney.
Journal of Environmental Quality, Vol 1, No 4, p 405-409, 1972. 6 tab, 16 ref.

Descriptors: *Sludge disposal, *Soil disposal fields, *Pulp wastes, Agronomic crops, *Oats, Waste water treatment, Nutrients, *Nitrogen compounds, *Fertilizers, Ultimate disposal, Waste disposal, Cereal crops, Plant growth, Trace elements, Solid wastes.

Sludge from paper mill effluents was mixed with soil in amounts of 2.5 or 10% (based on dry weight of the soil), and the effects of these mixtures on the growth of planted oats were investigated. Sludges from secondary treatment processes contained sufficient amounts of nitrogen, namely, nitrogen to organic carbon ratios of 1:12 to 1:50, and did not interfere with plant growth, whereas sludges from primary effluent treatments were deficient in N. High sludge concentrations inhibited plant growth, probably by affecting the uptake of Cu, Al, Fe, Zn, Mn, and similar trace elements. (Witt-IPC)
W74-04519

MILL'S WASTE WATER USED FOR SPRAY IRRIGATION.
For primary bibliographic entry see Field 5D.
W74-04543

HYDROGEOLOGIC CONSIDERATIONS IN SOLID WASTE STORAGE IN IOWA: PART 1. SANITARY LANDFILL SITE SELECTION: PART 2. A METHOD OF HAZARDOUS AND TOXIC WASTE DISPOSAL,
Geological Survey, Iowa City, Iowa.
S. J. Tuthill, D. L. Gordon, and F. H. Dorheim.
Public Information Circular No 4, September 1972. 59 p, 18 fig, 2 tab, 3 ref, append.

Descriptors: *Landfills, *Waste disposal wells, *Iowa, *Hydrogeology, Water law, *Regulation, Garbage dumps, Industrial wastes, Municipal wastes, Water pollution control.

In regions of low-density population, such as Iowa, a sanitary landfill that is precisley engineered and properly managed appears to be the most satisfactory solution for disposing of solid waste. Site selection is a question of first importance to the initial and long-range success of any landfilling operation. The requirements of the Iowa Code with respect to landfill site selection are discussed and geologic criteria that pertain to these rules are explained. Guidelines are discussed that indicate types of earth and rock conditions in Iowa that would tend to safeguard water resources. Where a less favorable site has to be used because of other constraints, suggestions are made that may assist the responsible community agency to make necessary modifications to protect the regional water supplies. Toxic-waste disposal in shale terrane is feasible by storing these waste fluids in drums within vertical shale storage shafts bored in essentially impermeable rock units. The shale storage shafts would be bored to depths limited only by the thickness of the rock unit and would accommodate a series of steel drums stacked in the holes. A minimum thickness of 30 feet of the same undisturbed shale should extend below any given storage shaft. The rock unit in which the shafts are excavated should be unjointed, unfractured, unfaulted, and nonfissile. (Knapp-USGS)
W74-04592

HYDROLOGIC AND GEOLOGIC CONSIDERATIONS FOR SOLID-WASTE DISPOSAL IN WEST-CENTRAL FLORIDA,
Geological Survey, Tallahassee, Fla.
J. W. Stewart, and A. D. Duerr.
Water-Resources Investigations 50-73, October 1973. 52 p, 36 fig, 17 ref.

Descriptors: *Landfills, *Garbage dumps, *Hydrogeology, *Path of pollutants, Water pollution sources, Groundwater movement, *Florida, Water pollution control, Planning, *Solid wastes, *Waste disposal.

Hydrogeologic studies are a prerequisite to selecting landfill sites in the karst topography of west-central Florida to minimize water pollution problems. Much of the area is low, poorly drained, and the water table is near land surface. Preparation of selected sites usually will require the construction of trenches with dikes to facilitate dewatering, extra pumps for dewatering during high intensity rainfall, and construction of oxidation ponds for retaining water pumped directly from active trenches, prior to discharging water out of the area. A water-quality network is also established to monitor the effects of solid wastes on the water resources of an area. The report contains 73 photographs that illustrate the various operations of solid-waste disposal, beginning from the initial investigation of a site to final burial of solid waste in a trench. (Knapp-USGS)
W74-04605

5F. Water Treatment and Quality Alteration

AN ASSESSMENT OF THE USE OF POTOMAC ESTUARY WATERS AND AWT EFFLUENTS FOR EMERGENCY WATER SUPPLY,
Meta Systems, Inc., Springfield, Va.
For primary bibliographic entry see Field 5D.
W74-04506

HYPOCHLORINATION OF POLLUTED STORM-WATER PUMPAGE AT NEW ORLEANS,
Pavia-Byrne Engineering Corp., New Orleans, La.
For primary bibliographic entry see Field 5D.
W74-04676

WATER PURIFICATION,
R. A. Starke.
U.S. Patent No. 3,776,524, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 917, No 1, p 211, December 4, 1973.

Descriptors: *Patents, *Water purification, *Filtration, Water quality control, Water pollution control, Pollution abatement, *Chlorination, *Waste water treatment, *Water treatment.

This invention relates to the chlorination of water for the purposes of sterilizing the water and more particularly the invention relates to the chlorination of water by means of gaseous chlorine produced in an electrolytic cell. It consists of a mixing chamber in which gaseous chlorine is mixed with water. The chamber has a float controlled inlet and an outlet dipping below the water level established by the float controlled valve. At a position above the water level there is an orifice and a chlorine gas inlet. The orifice limits the negative pressure in the chlorine gas inlet when water passes through the orifice under suction applied to the outlet. There is also provided a water filtering system wherein a supply of water under pressure is connected to the liquid inlet of the mixing chamber. The supply of chlorine gas is connected to the second inlet and the outlet passage is connected to a water pipe associated with the filter system, such that a negative pressure is applied to the outlet in operation. (Sinha-OEIS)
W74-04706

PROBLEM OF ISOLATING SALMONELLA FROM SURFACE WATERS EXEMPLIFIED BY LONG-TERM STUDIES IN THE BERLIN AREA, CAPITAL OF THE GERMAN DEMOCRATIC REPUBLIC, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W74-04835

OZONIZATION AS A METHOD OF PURIFYING WATER POLLUTED WITH CHEMICAL COMPOSITION, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).
For primary bibliographic entry see Field 5D.
W74-04836

HYGIENIC EFFICIENCY OF MEASURES FOR PROTECTING SURFACE WATERS IN UZBEK SSR, (IN RUSSIAN),
Uzbekskii Nauchno-Issledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
I. I. Il'inskii.
Gig Sanit. 37(11): p 21-24. 1972. (English summary).
Identifiers: *Hygienic measures, *USSR(Uzbek-SSR), *Water quality, Water supply, Water treatment.

Studies were done over several years on the quality of surface waters in the vicinity of large industrial enterprises and towns of Uzbek SSR (USSR). In the majority of investigated neighboring sites of water intake, the existing protection measures were hygienically sufficient.--Copyright 1973, Biological Abstracts, Inc.
W74-04838

AN EXPERIMENT IN SANITARY-VIROLOGICAL RESEARCH ON SEWAGE, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W74-04849

SALMONELLA SEROTYPES IN SEWAGE OF VARIOUS ORIGINS,
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
For primary bibliographic entry see Field 5B.
W74-04850

5G. Water Quality Control

APPROACHES TO STORMWATER MANAGEMENT,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5A.
W74-04458

STATE-OF-ART REVIEW: WATER POLLUTION CONTROL BENEFITS AND COSTS, VOL I,
Development Planning and Research Associates, Inc., Manhattan, Kans.
S. G. Unger, M. J. Emerson, and D. L. Jordening.
Copy Available from GPO Sup Doc as EP1.23:600/5-73-0082, $1.45; microfiche from NTIS as PB-228 603 $1.45. Environmental Protection Agency, Socioeconomic Studies Series Report EPA-600/5-73-008a, October 1973. 121 p, 31 exhibits. EPA Project 21-AQJ-05, 68-01-0744.

Descriptors: *Cost-benefit analysis, *Water pollution control, Water quality control, Benefits, Costs, Economics, *Reviews, *Pollution abatement, *Cost comparison.

A survey and assessment are presented of the state-of-art of economic analyses dealing with water pollution control benefits and costs. The investigation includes the extension of traditional benefit cost analysis into the area of pollution control. Implications for planning and research plus some directions of needed study are also

developed. A conceptual basis for benefit cost analysis involving water quality management is suggested. An economic concept of a social welfare function is presented as the most widely accepted public criterion which embodies environmental quality concerns. Problems of efficiency, equity, externalities and social discount rates are outlines. Also, the adequacy of such information is assessed. Benefit measurements of water quality factors are meager and underdeveloped. A variety of parial-equilibrium approaches to benefit measurement are outlined and some problems, including the planning horizon (time profile), are described. To assess benefit cost impacts of water pollution control, location-preserved analyses are necessary. An aggregation framework is needed. General systems analysis approaches are implicitly required to measure benefits and costs of pollution control. Recent developments in the literature have begun to directly assess impacts of environmental quality management. In this setting, benefit cost analysis effectively becomes a supplementary analysis of alternative sets of simulated general equilibrium types of economic solutions. (Freeman-EPA)
W74-04464

RESEARCH NEEDS AND PRIORITIES: WATER POLLUTION CONTROL BENEFITS AND COSTS, VOL. II,
Development Planning and Research Associates, Inc., Manhattan, Kan.
D. L. Jordening, and J. K. Allwood.
Copy available from GPO Sup Doc as EP1.23:600/5-73-008b, $2.10; microfiche from NTIS as PB-228 602 $1.45. Environmental Protection Agency, Socioeconomic Study Series Report, EPA-600/5-73-008b, October 1973. 198 p, 29 exhibits. EPA Project 21-AQJ-05, 68-01-0744.

Descriptors: *Cost-benefit analysis, *Water pollution control, Water quality control, Benefits, Costs, Economics, *Research priorities, *Pollution abatement, *Cost comparisons.
Identifiers: *Research needs.

A specification is presented of research needs and priorities involving water pollution control costs and benefits. A series of theoretcal and methodological research needs are presented. Water quality management is required in a dynamic setting and over a broad range of hydrologic and economic conditions. The common property resource aspects of the problem with the prevalence of externalities complicates the issues involved. These and other factors embedded in the research needs are discussed. A major development of a cost-minimization methodological approach for water quality management is also presented. Within this framework the indicated research needs are more readily identified and explained. An important distinction is made between the economic costs of pollution and the costs of pollution abatement. The economic costs of pollution such as damages, efficiency reductions, increased production expenses, process changes and opportunity costs are a function of water quality, whereas pollution abatement costs are typically a function of the degree of pollution control. For comparable cost comparisons, a transformation of pollution abatement costs in terms of water quality is desired. This transformation need and problem is discussed in detail. Finally, in a series of technical appendicies, the following subjects are discussed: (1) water pollution control cost and benefit estimates, (2) water quality associated health impacts. (Freeman-EPA)
W74-04465

STATE ENVIRONMENTAL MANAGEMENT, CASE STUDIES OF NINE STATES,
E. H. Haskell, and V. S. Price.
Praeger, New York, N.Y. 1973. 283 p. Price: $5.95.

Descriptors: *State jurisdiction, *Planning, *Regulation, *Pollution, *State governments, Administrative agencies, Water pollution, Waste disposal, Land use, Natural resources, Illinois, Washington, Wisconsin, Minnesota, New York, Maine, Vermont, Maryland, Michigan.
Identifiers: *Environmental management, Judicial mechanisms.

Ways are examined in which 9 state governments have restructured organizationally in order to improve environmental protection through new regulatory powers over pollution and land use problems. Two types of reforms are covered. The first are new environmental departments created by the reorganization of existing state agencies to give pollution and resource programs an 'ecological' perspective and higher priority in state government. Programs adopted by Illinois, Washington, Wisconsin, Minnesota, and New York are analyzed. The second set of changes evaluated involve new organizations to implement state strategies for land use control, waste management and citizen action. Vermont and Maine have created agencies to regulate land development, statewide. In Maryland, the state Environmental Service has the authority to draft regional plans, finance, build, operate, and own solid and liquid waste treatment and disposal facilities, wholesaling services to local governments and industry. Michigan has given state courts a new role through the inception of public-interest lawsuits by private citizens. Criteria for evaluating public environmental institutions are developed. In accordance with these criteria, recommendations are made for a model state environmental structure. (Hoffman-North Carolina)
W74-04503

ENVIRONMENTAL QUALITY, THE FOURTH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY.
Council on Environmental Quality, Washington, D.C.
U.S. Government Printing Office, Washington, D.C., September 1973. 499 p, $4.30.

Descriptors: *Water pollution, *Pollution abatement, *Regulation, Institutional constraints, Governments, Federal Water Pollution Control Act, Water quality, International waters, International commissions, Earth-water interface, Public access, Great Lakes, Costs.
Identifiers: *Willamette River(Oregon), Greenway Concept, Water quality index, EPA eutrophication study, Federal Water Pollution Amendment of 1972.

Seven categories of environmental concern are covered: the urban environment; water quality improvement; economics and environmental management; law and land use regulations; federal environmental programs; international environmental programs; environmental status and trends; and the citizen's role in environmental improvement. The topic of water resources is treated both individually and in relation to economics, land use, law, and international and federal programs. The cleanup of the Willamette River in Oregon is examined as a model of the process of reversing water pollution. The effect of the clean river on land use along the river, including public access and associated recreational facilities, is also studied. The chapter on the relationship between economics and environmental policy describes four types of environmental costs of pollution and pollution control: abatement costs, avoidance costs, transaction costs, and damage costs. Judicial response to restrictions on the filling or developing of low-lying marsh and coastal lands is discussed in the context of the limitations imposed by the 'taking' clause on state and local governmental efforts to protect environmentally critical areas. The Federal Water Pollution Control Act Amendments of 1972 are summarized and analyzed. Efforts to monitor water pollution are surveyed. The pollution status of the Great Lakes and the oceans is examined. International environmental protection concerns, including protection of the oceans and control of transboundary pollution, are discussed. (Hoffman-North Carolina)
W74-04504

MANAGING GROWTH IN A FRAGILE ENVIRONMENT: PROBLEMS OF THE ROCKY MOUNTAIN STATES,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 6D.
W74-04505

1972 REVIEW OF THE LITERATURE ON PULP AND PAPER EFFLUENT MANAGEMENT,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W74-04540

PHYSICOCHEMICAL PROCESSES FOR WATER QUALITY CONTROL,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-04546

WASTE AUTOMOTIVE LUBRICATING OIL AS A MUNICIPAL INCINERATOR FUEL,
GCA Corp., Bedford, Mass. GCA Technology Div.
For primary bibliographic entry see Field 5D.
W74-04549

BENEFIT OF WATER POLLUTION CONTROL ON PROPERTY VALUES,
Dornbusch (David M.) and Co., Inc., San Francisco, Calif.
D. M. Dornbusch, and S. M. Barrager.
Copy available from GPO Sup Doc as EP1.23:600/5-73-005, $1.60; microfiche from NTIS as PB-228 590, $1.45. Environmental Protection Agency, Socioeconomic Studies Series Report, EPA-600/5-73-005, October 1973. 148 p, 14 fig, 15 tab, 15 ref. EPA Project 01AAB-07, Contract 68-01-0753.

Descriptors: Water quality, *Water quality control, *Economics, *Benefits, *Property values, *Regression analysis, *Pollution abatement.
Identifiers: San Diego Bay, Kanawha River(Ohio), Willamette River.

This study was undertaken to determine the current state-of-knowledge concerning the measurement of the potential benefit of water pollution control on property values, and to analyze the relationship between water quality parameters and property values at several sites where water pollution has been substantially reduced in recent years. Multiple-regression analysis and an interview technique were employed to study the relationship between residential and recreational property values and water quality components. Study sites were located on San Diego Bay and the Kanawha, Ohio, and Willamette Rivers. It was found that effective pollution abatement on badly polluted water bodies can increase the value of single-family homes situated on waterfront lots by 8 to 25 percent, and that these water quality improvements can affect property values up to 4000 feet away from the water's edge. The measurable water quality parameters which have the greatest influence on property values are dissolved oxygen concentration, fecal coliform concentrations, clarity, visual pollutants (trash and debris), toxic chemicals, and pH. Case study results were combined with a 1971 EPA water pollution survey to estimate the national benefit expressed in increased residential, recreational and rural waterfront property values, to be gained from water pollution abatement. The estimated capital value of the benefit ranges from .6 to 3.1 billion dollars, with a most likely benefit of 1.3 billion dollars. (EPA)

W74-04550

REVIEWING ENVIRONMENTAL IMPACT STATEMENTS-POWER PLANT COOLING SYSTEMS, ENGINEERING ASPECTS,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
Copy Available from GPO Sup Doc as EP1.23:660/2-73-016, $1.35; microfiche from NTIS as PB-228 604 $1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-016, October 1973. 93 p, 12 fig, 9 tab, 60 ref. EPA Program Elements 1BA032 and 1BB392.

Descriptors: *Thermal powerplants, *Nuclear powerplants, *Environmental effects, Electric power, cost-benefit analysis, Cooling towers, *Thermal pollution, *Reviews.
Identifiers: *Environmental impact statements, *Cooling water systems.

This report describes the approach and technical base that have been used by EPA's National Thermal Pollution Research Program for reviewing those portions of Environmental Impact Statements (EIS's) relative to the engineering aspects (including economics) of cooling water systems for thermal power plants. Techniques and data are provided to enable the EIS reviewer to make sound judgements concerning the adequacy of both the cooling water system selected for the power plant and the EIS comments on that system. Literature citations are provided to direct the reviewer to additional and more detailed information. Information and discussions are provided on cooling system configuration, operation, environmental effects, and costs. Consideration is given to the intake as well as the discharge. Various closed-cycle cooling systems employing cooling towers, cooling ponds, spray systems, and other devices are covered. Methods of assessing alternative slections and benefit-cost analyses are presented. Non-thermal aspects of cooling water systems are discussed. The report lays the groundwork for a technically sound EIS review; however, the reviewer must supplement the material presented with references and perhaps technical consultation to prepare comprehensive and detailed review comments. (EPA)
W74-04555

LABORATORY STUDY OF SELF-SEALING LIMESTONE PLUGS FOR MINE OPENINGS,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
R. G. Penrose, Jr., and I. Holubec.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-081, $2.25 microfiche from NTIS as PB-228-586. Environmental Protection Agency, Technology Series Report EPA-670/2-73-081, September 1973. 217 p, 63 fig, 114 tab, 2 ref. EPA Project 14016 JBU, Contract 68-01-0135.

Descriptors: *Limestones, *Acid mine water, *Laboratory tests, *Pilot plants, Neutralization, *Sealants, *Aggregates, Iron, Particle size, Cements, Permeability, Compressibility, Strength of materials.
Identifiers: *Mine seals, Ferrous waters, Ferric water.

Laboratory studies of self-sealing limestone plugs for mine openings were conducted to determine the optimum limestone material for such a treatment and sealant technique. Conducting a thorough study of the performance of such plugs required pilot plant operations utilizing synthetic solutions representative of anticipated acid mine waters, aggregate additives to improve plug performance, and several basic types of limestone which were varied interms of size gradation and placement density. The types of limestone used were selected from results of a previous neutralization study; synthetic mine waters were prepared to EPA formulations for ferric, ferrous, and ferrous/ferric solutions; and percentage admixture of bentonite, flyash and air-cooled blast furnace slag additives were used with the aggregate. Experimental results indicated that permeability, compressibility and strength of a limestone plug are primarily a function of the particle size distribution and density. Plug performance was most effective with high limestone placement density and smaller gradation of stone. Ferric waters were controlled most effectively. Additive effects were less significant throughout the tests. Further tests were conducted on the effects of particle size distribution variations and placement density and other additives to cement particles into an effective plug. (EPA)
W74-04559

APPLICATION OF DYNAMIC PROGRAMMING IN MARKOV CHAINS TO THE EVALUATION OF WATER QUALITY IN IRRIGATION,
Hebrew Univ., Jerusalem (Israel).
For primary bibliographic entry see Field 3C.
W74-04561

WATER QUALITY IMPROVEMENT IN RIVER BASINS (EXPERIENCE OF INDUSTRIALIZED COUNTIRES) (O POVYSHENII KACHESTVA VODY V RECHNYKH BASSEYNAKH (OPYT INDUSTRIAL'NYKH STRAN)),
A. D. Pobedimskiy.
Vodnyye Resursy, No 3, p 187-200, 1973. 5 fig, 4 tab, 7 ref.

Descriptors: *River basins, Water quality, *Water quality control, *Water pollution control, Waste treatment, *Waste water treatment, *Water treatment, Water purification, Model studies, Economics, Costs.
Identifiers: *USSR.

The magnitude of water pollution in industrialized countries and measures being undertaken to improve water quality in their river basins are described. These measures include research on an economically optimal water quality improvement system; development of an optimal system of waste dilution; artificial reaeration of water flows; construction of large treatment facilities; and use of sensors for automated water quality monitoring. All methods are illustrated by specific examples. (Josefson-USGS)
W74-04583

HYDROLOGIC INVESTIGATION AND DESIGN IN URBAN AREAS--A REVIEW,
Snowy Mountains Engineering Corp., Cooma (Australia).
For primary bibliographic entry see Field 2A.
W74-04597

EFFECTS OF BACKPUMPING FROM SOUTH NEW RIVER CANAL AT PUMP STATION S-9 ON QUALITY OF WATER IN WATER-CONSERVATION AREA 3, BROWARD COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 5B.
W74-04600

WHAT'S WRONG WITH GOVERNMENT WATER CONTROL PROGRAMS AND HOW THEY CAN BE IMPROVED,
Georgia Coll., Milledgeville. Dept. of Business Administration and Economics.
For primary bibliographic entry see Field 5D.
W74-04632

STATE STANDARDS FOR TEMPERATURE, (ISSUED BY THE ENVIRONMENTAL PROTECTION AGENCY IN AUGUST 1972).
Environmental Reporter, p 33-54, 1973, 2 tab.

Descriptors: *Regulation, Governments, *Water policy, *Water temperature, Water quality control, Management, Federal government, *State governments, Interstate rivers, Thermal properties, Cooling, Thermal pollution, Legislation, Seasonal, Aquatic environment, Fish, *Water quality standards.

Excerpts from individual Federal-State water quality standards establishing temperature criteria for interstate waters have been compiled in order to provide general information to the public as well as Federal, State, and local officials. This report represents the first nationwide strategy for water quality management and reflects the major uses to be made of the water (recreation, drinking water, fish and wildlife propagation, industrial, or agricultural uses). Temperature standards are set to control thermal pollution, which may create adverse conditions for aquatic life, accelerate biological processes in the streams, reduce the dissolved oxygen content of the water or increase the growth of aquatic plants. Individual state-adopted criteria are listed with the latest revisions of standards as of the date of printing. (Jerome-Vanderbilt)
W74-04669

ROLE OF PHYTO- AND ZOOPLANKTON IN SELF-PURIFICATION PROCESSES (EXEMPLIFIED BY OXIDATION PONDS), (IN RUSSIAN),
Belorussian State Univ., Minsk (USSR).
N. M. Kryuchkova.
Gidrobiol Zh. Vol 8, No 5, p 106-111. 1972.
Identifiers: Metabolism, Microbial processes, *Oxidation ponds, *Phytoplankton, *Zooplankton, *Self purification.

In addition to the known value of microbiological processes, the activity of phyto- and zooplankton plays a major role in the self-purification of water bodies. The examples given show that under certain conditions phyto- and zooplankton acquire decisive significance for self-purification processes. However, in all cases this process is the general result of the activity of the entire microbial, plant, and animal population of the water body or stream.--Copyright 1973, Biological Abstracts, Inc.
W74-04692

EFFECT OF LONG-TERM APPLICATION OF VARIOUSLY HIGH RATES OF NUTRIENTS ON NATURAL GRASSLAND SWARDS,
For primary bibliographic entry see Field 4A.
W74-04693

ANTI-POLLUTION BARRIER,
Etablissements Hutchinson Compagnie Nationale du Caoutchouc, Paris (France)(Assignee).
G. A. Lamboley.
U.S. Patent No 3,775,982, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 917, No 1, p 68, December 4, 1973.

Descriptors: *Patents, *Barriers, *Oil spills, *Oil pollution, Coasts, Tides, Waves(Water), (*Shore protection, *Pollution abatement, Water quality control, Water pollution control.

An anti-pollution barrier consists of a watertight skirt, which has floats and ballast and is connected to a tension element having tensile strength at spaced apart points defining longitudinal segments on the skirt and on the tension element. The tension element is a semi-rigid flat strip which is located roughly midway up the height of the skirt and rigidly fastened to the skit by transverse stiffening provided at the respective fastening points. To preclude a tilting of the barrier of more than 90 deg, it is desirable that a reinforcing strip constitute an auxiliary ballast opposing the raising torque. The skirt thus maintains under all circumstances a definite orientation which enables it to be used as a coastal barrier in a tidal region. (Sinha-OEIS)
W74-04705

SKIMMER TRAP,
B. H. Field.
U.S. Patent No. 3,774,767, 3 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 916, No 4, p 1360, November 27, 1973.

Descriptors: *Patents, *Skimming, Separation techniques, *Flotsam, *Pollution abatement, *Water treatment, *Water quality control.

The trap consists of an elongated buoyant tubular member having angled inner and outer ends. A water flow intercepting flat strip is affixed to the upstream side of the tubular member with the strip including a skimmer-engaging angled inner end. The corresponding inner end of the buoyant member engages the side of the pool and properly orientates the trap at a projecting 45 deg angle for an interception of the flow-impelled debris and the directing of it into the skimmer. The outer end of the buoyant member is directed upstream for a confining of the floating debris. The entire trap is stabilized and retained in position by an elongated cord-like member extending from a midpoint along the trap to a simple decorative weight positioned as desired along the pool edge. As an auxiliary aid in the gathering of the debris, an arcuate shield can be removably clipped on the tubular member. (Sinha-OEIS)
W74-04713

ANTI-POLLUTION BARGE AND CONVEYER ASSEMBLY,
J. A. Anderson.
U.S. Patent No. 3,762,558, 3 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 915, No 1, p 161, October 2, 1973.

Descriptors: *Patents, *Oil pollution, Separation techniques, Equipment, Barges, *Oil spills, *Pollution abatement, Water quality control, *Water pollution control, *Conveyance structures.

A bottom conveyer is constructed and arranged so as to be supported by the bow of a barge. It protrudes downward and forward. A top conveyer is mounted superjacent to the bottom conveyer and works with it. Each of the conveyers has an imperforate flexible endless belt. The adjacent runs of the belts are flat surfaces longitudinally and transversely of the belts. The superjacent conveyers are arranged to pick up a floating pollutant and convey it upward between adjacent runs of the respective conveyers. Transverse ribs are secured to the top conveyer and extend therefrom into liquid-tight edgewise engagement with the top run of the bottom conveyer. Longitudinal flexible wings are arranged to laterally confine the picked up pollutants and water during upward displacement thereof. The conveyers are pivoted onto the barge. The barge is provided with water ballast tanks to adjust the dipping depth of the outer end of the conveyers. (Sinha-OEIS)
W74-04718

A REPORT ON THE LIMNOLOGY OF MONROE RESERVOIR, INDIANA,
Indiana Univ., Bloomington. School of Public and Environmental Affairs.
For primary bibliographic entry see Field 2H.
W74-04792

PROBLEM OF PURE WATER IN THE USA, (IN RUSSIAN),
Vsesoyuznyi Institut Nauchno-Tekhnicheskoi Informatsii po Selskomu Khozyaistvu, Moscow (USSR).
V. D. Fokina.
Gig Sanit. 37(10): p 71-73. 1972.
Identifiers: *Oil pollution, *Thermal pollution, *Water pollution sources, Oil spills, *Water pollution control, *Legislation.

Information is given on the main sources of water pollution in the USA, losses due to oil spills, thermal pollution, federal laws passed concerning pollution and measures taken by various industries to control pollution.--Copyright 1973, Biological Abstracts, Inc.
W74-04837

SOME PROBLEMS INVOLVED IN OPTIMAL PROTECTION OF THE ENVIRONMENT IN SPAS,
Instytut Balneoklimatyczny, Poznan (Poland).
A. Madeyski.
Balneol Pol. Vol 16, No 3/4, p 241-246. 1971.
Identifiers: Air pollution, *Environmental protection, Noise pollution, *Spas, Water pollution.

Health resorts should be away from urban agglomerations. The natural capacity of the environment should not be overreached. Industrial plants should be erected far away from these places. Noise, water and air pollution should be avoided.--Copyright 1973, Biological Abstracts, Inc.
W74-04847

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMAL OPERATION OF MULTI-RESERVOIR WATER RESOURCES SYSTEMS,
Texas Univ., Austin. Center for Research in Water.
For primary bibliographic entry see Field 4A.
W74-04314

MATHEMATICAL MODELING FOR STATUS PREDICTION AND CONTROL OF WATER DISTRIBUTION SYSTEMS,
General Electric Co., Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W74-04320

FLOOD PROOFING DECISIONS UNDER UNCERTAINTY: AN APPLICATION TO THE CONNECTICUT RIVER BASIN,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
P. Aklilu, and C. E. Willis.
Available from the National Technical Information Service as PB-228 133 $8.50 in paper copy, $1.45 in microfiche. Water Resources Research Center, University of Massachusetts, Amherst, Publication No 33, August 1973. 99 p, 4 fig, 19 tab, 64 ref, 2 append. OWRR B-028-MASS(1), 14-31-0001-3896.

Descriptors: *Flood damage, *Non-structural alternatives, *Computer programs, Optimization, Economic efficiency, *Flood control, Maximum probable flood, *Connecticut River, *Risks, *Decision making, Benefits, Costs, Model studies, Evaluation.
Identifiers: Flood proofing, Expected values.

Results are presented of the economic potential of flood proofing measures for reducing flood damages. The empirical application focuses on several communities in the Connecticut River Basin. A literature review of flood proofing measures and a treatment of decision-making under uncertainty are included. A partial equilibrium framework (model) for making flood proofing choices for various types of structures is also provided. The output of this model takes the form of expected values and standard deviations of net benefits from flood proofing. These computer results are tabulated, and some remarks are made concerning the incidence of benefits and costs of such flood damage reduction measures.
W74-04463

APPLICATION OF DYNAMIC PROGRAMMING IN MARKOV CHAINS TO THE EVALUATION OF WATER QUALITY IN IRRIGATION,
Hebrew Univ., Jerusalem (Israel).
For primary bibliographic entry see Field 3C.
W74-04561

ALLOCATION OF FUNDING FOR WASTE-WATER TREATMENT FACILITIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-04562

ECONOMIC ASPECTS OF GROUND WATER RESOURCES AND REPLACEMENT FLOWS IN SEMIARID AGRICULTURAL AREAS,
New Mexico Univ., Albuquerque.
For primary bibliographic entry see Field 4B.
W74-04563

A SIMULATION MODEL FOR EVALUATING IRRIGATION MANAGEMENT PRACTICES,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-04564

COST-BENEFIT ANALYSIS OF IRRIGATION PROJECTS IN NORTHEASTERN BRAZIL,
Brookings Institution, Washington, D.C.
For primary bibliographic entry see Field 3F.
W74-04565

ALLOCATION OF SCARCE RESOURCES TO AGRICULTURAL RESEARCH: REVIEW OF METHODOLOGY,
North Crolina State Univ., Raleigh. Dept. of Economics.
For primary bibliographic entry see Field 3F.
W74-04566

6B. Evaluation Process

A DETAILED INVESTIGATION OF THE SOCIOLOGICAL, ECONOMIC, AND ECOLOGICAL ASPECTS OF PROPOSED RESERVOIR SITES IN THE SALT RIVER BASIN OF KENTUCKY,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 2A.
W74-04310

SOCIOCULTURAL IMPACT OF RESERVOIRS ON LOCAL GOVERNMENT INSTITUTIONS, ANTHROPOLOGICAL ANALYSIS OF SOCIAL AND CULTURAL BENEFITS AND COSTS FROM STREAM CONTROL MEASURES--PHASE 4,
Kentucky Water Resources Research Inst., Lexington.
P. Drucker, J. E. Clark, and L. D. Smith.
Available from National Technical Information Service as PB-227 968 $8.75 in paper copy, $1.45 in microfiche. Research Report No 65, 1973. 108 p, 9 tab, 33 ref, append. OWRR B-027-KY(2). 14-31-0001-3595.

Descriptors: *Kentucky, *Social impact, *Institutions, Planning, Assessments, Highway relocation, Law enforcement, *Local governments, Roads, Zoning, *Social change, Social values, *Taxes, Tourism, Water supply, *Land use, Land development, *Pre-impoundment, Post-impoundment, Reservoir sites, Community development.

This study of the probable sociocultural impact of a proposed reservoir in central Kentucky on the institutions of local governments of a community

adjacent to the reservoir utilizes anthropological concepts of social values and cultural and social change as well as anthropological research techniques. Data on observed impact on the same institutions in communities adjacent to two recently completed Kentucky reservoirs permit inferences as to probable directions and extent of reservoir-related change. Specific aspects of impact considered include: effects of reduction of the county tax base due to Federal acquisition of lands, including necessity for increased severity of taxes and changes in assessments, problems related to effective planning and zoning, potential benefits from development or expansion of city and county potable water supply, effects of reservoir-caused highway relocation on county roads and county road maintenance, and effects of reservoir-created tourism patterns on local law enforcement. The overall purpose is to recommend to the agency (Corps of Engineers) that is causing massive environmental change through creation of a manmade lake, improvements in policies and procedures that will increase sociocultural benefits and decrease sociocultural costs. (See also W74-00558) (Grieves-Kentucky)
W74-04311

SOCIAL, ECONOMIC, ENVIRONMENTAL, AND TECHNICAL FACTORS INFLUENCING WATER REUSE,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5D.
W74-04317

MULTIPURPOSE RESERVOIRS AND URBAN DEVELOPMENT,
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
R. J. Burby, III, T. G. Donnelly, and S. F. Weiss.
Available from National Technical Information Service as PB-228 009 $3.75 in paper copy, $1.45 in microfiche. Workshop on 'Planning the Development and Use of Reservoir Shorelines in North Carolina' at Chapel Hill, North Carolina, September 21, 1972. 44 p, 8 tab, 3 fig, append. OWRR B-012-NC(12).

Descriptors: *Recreation demand, Recreation facilities, Reservoirs, *Computer models, *Land development, *Impoundments, Recreation, Model studies, Land use, Land tenure, Water resources, Rural areas, Community development, Boating, Southeast U.S., *Georgia, *North Carolina, *Urbanization, *Multiple-purpose reservoirs.
Identifiers: Second home communities, Vacation home developments, Development process, Lake Sidney Lanier(Ga.), Lake Norman(N.C.), Land development firms, Reservoir development agencies.

The development of recreational communities in rural hinterlands of metropolitan areas can cause environment and service problems for affected governmental units. This development process, initiated by a reservoir owner wishing to create a water impoundment, proceeds through a series of stages beginning with rural use and ending with seasonal or permanent residence. About 75% of lots are developed by land development firms, as seen in recreational subdivisions adjacent to Lake Norman, North Carolina, and Lake Sidney Lanier, Georgia. Various attractiveness factors motivate consumer purchases of lots, including character of the property and proximity to reservoir, friends, cities, and work. A computer model simulates these location patterns through a randomized procedure assigning households to sites according to the supply of land and its attractiveness for residential use. The model 'forecasted' 1969 patterns to compare results obtained from the simulation with actual development. Results showed more scatterization than actually occurred in these communities; more precise land use constraints could eliminate this problem. Since factors determining residential patterns in each community are unique, no general set of inputs can exist. Refinements in the model are needed, but it can still aid in anticipating problems with development in recreational communities. (Gorden-North Carolina)
W74-04319

INSTITUTIONAL FRAMEWORK AFFECTING THE USE OF INLAND WETLANDS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 4A.
W74-04462

STATE-OF-ART REVIEW: WATER POLLUTION CONTROL BENEFITS AND COSTS, VOL I,
Development Planning and Research Associates, Inc., Manhattan, Kans.
For primary bibliographic entry see Field 5G.
W74-04464

RESEARCH NEEDS AND PRIORITIES: WATER POLLUTION CONTROL BENEFITS AND COSTS, VOL. II,
Development Planning and Research Associates, Inc., Manhattan, Kan.
For primary bibliographic entry see Field 5G.
W74-04465

ESTIMATING THE BENEFITS OF STREAM VALLEY AND OPEN SPACE PRESERVATION PROJECTS,
Regional Science Research Inst., Philadelphia, Pa.
R. E. Coughlin, and T. R. Hammer.
In: Government Spending and Land Values: Public Money and Private Gain, ed. by C. L. Harriss. University of Wisconsin Press, Madison, p 155-170, 1973. 5 fig, 2 tab.

Descriptors: *Project benefits, *Estimated benefits, Streams, *Water pollution effects, Evaluation, Analysis, Pricing, Value, *Water quality, *Pennsylvania, *Parks.
Identifiers: *Environmental quality, *Location rent gradient, Land values, Pennypack Park, *Philadelphia(Penn), Ecological benefit, Open spaces.

Benefits are estimated for environmental projects that involve maintaining the water quality of streams and keeping extensive areas of land undeveloped. Environmental values are translated into land values. Given that persons considering a residential site near some amenity are able to imagine the use and enjoyment to be derived, and that people are willing to attach some monetary value to this use and enjoyment, environmental benefit differences create a location rent gradient. A number of studies of people's response to environmental quality are summarized. Relative to the hypothesized preconditions for location rent, the studies suggest that: (1) people do not do a good job of imagining how they would make use of an amenity if they lived nearby and; (2) even those who are currently enjoying benefits of some environmental amenity may not attribute a very high monetary value to it. Implied is that environmental benefits may be undervalued and that this is reflected in location rents. Property values around Pennypack Park in Philadelphia, Penn. were used to estimate the value of location rent generated by a stream-valley park. Location rent ranged from about $1,171 per property at 40 feet from the park to $104 per property at 2,500 feet from the park. Considering that the opportunity cost of retaining the park would be $13 million, location rent is heavily underestimated. (Hoffman - North Carolina)
W74-04500

CAPITALIZATION OF THE BENEFITS OF WATER RESOURCE DEVELOPMENT,
Kansas Univ., Lawrence.
D. W. Daicoff.
In: Government Spending and Land Values: Public Money and Private Gain, ed. by C. L. Harriss. University of Wisconsin Press, Madison, p 189-199, 1973.

Descriptors: *Project benefits, *Water resources development, Recreation, Navigation, Flood control, *Property values, Capital.
Identifiers: *Capitalization of benefits, Property value increases.

The consequences of governmental expenditures on water resource development projects for the value of real property in terms of capitalization of benefits is considered. The present value of the expenditure-benefit augmented value stream can be found by discounting a stream of government expenditure benefits and adding them the discounted stream of private benefits. By subtraction the capitalized value of the expenditure benefit may be estimated. Several conditions, relating to the type of object or activity benefited by the public expenditure and to the specific nature of the expenditure benefits, are necessary for capitalization of water resource development projects. They are: (1) the object or activity must be salable; (2) some of the benefits must be in the future; (3) there must be some differential to be capitalized; and(4) benefits must not be shifted to another object or activity. The influence of flood control, navigation, and recreation project expenditure on the value of property is discussed. Empirical studies cited show that a portion of the benefits of water resource development projects is observable in property value. Some questions remain, though, as to the degree of capitalization and the extent to which it can be measured. (Hoffman-North Carolina)
W74-04501

LAND VALUE INCREMENTS AS A MEASURE OF THE NET BENEFITS OF URBAN WATER SUPPLY PROJECTS IN DEVELOPING COUNTRIES: THEORY AND MEASUREMENT,
Maxwell Graduate School of Citizenship and Public Affairs, Syracuse, N.Y. Metropolitan and Regional Research Center.
R. W. Bahl, S. P. Coelen, and J. J. Warford.
In: Government Spending and Land Values: Public Money and Private Gain, ed. by C. L. Harriss. University of Wisconsin Press, Madison, p 171-188, 1973.

Descriptors: *Water supply development, *Project benefits, *Estimated benefits, Evaluation, Regression analysis, Pricing, Value, Land development, *Water supply.
Identifiers: Water supply benefit measurement, *Land values, Control area analysis, *Developing countries.

The market for water services does not permit benefit estimation of the willingness of individuals to pay for public improvements in water. Land values can be used as an additional measure: the increased consumers' surplus area under the demand curve in the water market is transferred into an equivalent shift in area under the property market demand curve. All benefits of a water supply project not measured in renevues derived directly through sales in the water market can be measured from the consumer surplus transferred from water to property markets. Two supply and demand conditions are necessary for the land value increment to totally exhaust the benefit increment: the slope of the demand curve for housing in the project area cannot change; and the supply curve must be perfectly inelastic. Given these conditions any error in true benefits of a water supply will be on the conservative side. Three possible approaches to empirical measurement of water supply benefits are suggested: a regression model using dummy variables to indicate exogeneous factors affecting

land values; a control area analysis where the control area is expected to be similar in all respects to the project area except for the water project; and a modified, combined regression-control area model. A brief discussion of other land-value studies, as well as behavioral and institutional relationships that affect the investment-land value nexus is included. (Hoffman-North Carolina)
W74-04502

BENEFIT OF WATER POLLUTION CONTROL ON PROPERTY VALUES,
Dornbusch (David M.) and Co., Inc., San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W74-04550

ALLOCATION OF FUNDING FOR WASTE-WATER TREATMENT FACILITIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-04562

COST-BENEFIT ANALYSIS OF IRRIGATION PROJECTS IN NORTHEASTERN BRAZIL,
Brookings Institution, Washington, D.C.
For primary bibliographic entry see Field 3F.
W74-04565

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

STUDY OF PULP AND PAPER INDUSTRY'S EFFLUENT TREATMENT.
EKONO, Helsinki (Finland).
For primary bibliographic entry see Field 5D.
W74-04538

EVALUATION OF THE USE OF PRICING AS A TOOL FOR CONSERVING WATER,
George Washington Univ., Washington, D.C. Dept. of Management Sciences.
For primary bibliographic entry see Field 3D.
W74-04810

6D. Water Demand

MANAGEMENT OF STORMWATER RUNOFF IN SUBURBAN ENVIRONMENTS,
Engineering-Science, Inc., Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W74-04302

THE RAJASTHAN CANAL AREA: A SETTLEMENT STRUCTURE,
Delhi Univ., New Delhi (India). School of Planning and Architecture.
L. Vagale.
Urban and Rural Planning Thought, Vol 16, No 3, p 148-186, July, 1973. 15 fig, 17 tab, 18 ref.

Descriptors: Irrigation, *Irrigation programs, Irrigation systems, *Irrigation canals, *Irrigation districts, *Land use, *Canals, Land management, Water management, Land, Arable land, Distribution systems, Cultivation, Crop production, Cultivated lands, Agriculture.
Identifiers: *India(Rajasthan Canal Project), Colonization, Settlement hierarchy, Multi-level planning system, Five Year Plan.

The Rajasthan Canal Project, an irrigation plan undertaken by the Indian government, hopes to irrigate 6.7 million acres of land by distributing water through a canal network 45,341 miles long. Started in 1958, it will be implemented in two stages, but work is behind schedule. Apart from the irrigation project, planned 'colonization' must be implemented. This includes a functional hierarchy of villages linked by transportation modes, provided with the necessary infrastructure, and familiarized with new techniques of irrigation and agriculture. Population distribution patters, optimum size of land holdings, desirable crop patterns, and other factors must be considered. Basic villages, with 1200-1500 people, form the first order settlement in the hierarchy, providing basic services for the community. Central villages, with 4,000-5,000 people form the second tier, serving 4-6 villages. Market towns, with 20,000-25,000 inhabitants, form the next level and are located along major canals. The sub-regional center, with 40,000-50,000 people, is the highest order of settlement. Located along main canals, they serve 6-8 market towns, 30-40 central villages, and 140-150 basic villages. A multidisciplinary approach, including land and water use planning, is essential for this area's development. (Grden - North Carolina)
W74-04499

MANAGING GROWTH IN A FRAGILE ENVIRONMENT: PROBLEMS OF THE ROCKY MOUNTAIN STATES,
Colorado State Univ., Fort Collins.
E. Vlachos.
Presented at Symposium on 'Property Rights and Institutions for Achieving Public Interests in Management of Land Resources,' Annual meeting of American Association for Advancement of Science, Washington, D.C., December 26-31, 1972. 45 p, 4 fig, 1 tab. OWRR B-083-COLO(1).

Descriptors: *Planning, *Water supply, *Water demand, *Environmental effects, *Growth rates, *Rocky Mountain region, Water resources, Urban land use, Coordination, Water quality, Montana, Idaho, Wyoming, Colorado, Nevada, Arizona, Utah, New Mexico, Management, Water shortage, Water rights, Political aspects, Water requirements, Water pollution, Urbanization, Regulation.
Identifiers: Growth management, *Regulatory technique.

In the Rocky Mountain states, the limited water resources combined with the precarious physical environment are constant constraints of present and future growth in the area. Trends affecting these states are increasing population through westward migration, increasing urbanization and rural decline, increasing industrialization with new values and behavior patterns, and increasing concern with ecological mismanagement. Water shortages are expected by the year 2020 with continuing population and urban growth. Water management becomes an important means of controlling, coordinating, and allocating the existing and future rights to the use of water, and thus offers the opportunity for the achievement of larger goals of a social policy for concerted land development. Choices involved are either total use is brought into line with supply or one type of use might be sacrificed to maintain another. Use of water through federal projects for agriculture in formerly arid lands while moisture-rich areas of the country exist is increasingly questioned. Interstate rivalry for water may be expected. The future of the region depends on both augmenting the natural supplies and developing alternative means for meeting competing demands. The policy for maximizing water supplies hinges on strong incentives for efficient or new uses including economic benefits, and redefinition of the doctrine of beneficial use; structural changes such as new organizational arrangements, creation of new state agencies; and regulatory counter-incentives such as stricter enforcement and pricing policies. Other policies which can supplement water as a means of controlling growth are suggested. (Edwards-North Carolina)
W74-04505

SYRACUSE METROPOLITAN AREA COMPREHENSIVE PLAN-WATER AND SEWER PLAN AND SERVICES ALLOCATION PLAN,
Syracuse-Onondaga County Planning Agency, N.Y.
For primary bibliographic entry see Field 5D.
W74-04507

PRATTVILLE, ALABAMA COMMUNITY DEVELOPMENT PLAN, VOL. II: SUMMARY AND ILLUSTRATIONS.
Central Alabama Regional Planning and Development Commission, Montgomery.
For primary bibliographic entry see Field 5D.
W74-04508

ECONOMIC ASPECTS OF GROUND WATER RESOURCES AND REPLACEMENT FLOWS IN SEMIARID AGRICULTURAL AREAS,
New Mexico Univ., Albuquerque.
For primary bibliographic entry see Field 4B.
W74-04563

THE OPERATION OF A STREAM-AQUIFER SYSTEM UNDER STOCHASTIC DEMANDS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W74-04808

EVALUATION OF THE USE OF PRICING AS A TOOL FOR CONSERVING WATER,
George Washington Univ., Washington, D.C. Dept. of Management Sciences.
For primary bibliographic entry see Field 3D.
W74-04810

6E. Water Law and Institutions

A STUDY OF WATER INSTITUTIONS IN UTAH AND THEIR INFLUENCE ON THE PLANNING, DEVELOPING, AND MANAGING OF WATER RESOURCES,
Utah Center for Water Resources Research, Logan.
F. W. Haws.
Available from National Technical Information Service as PB-227 914 $3.75 in paper copy, $1.45 in microfiche. Completion Report, Utah Water Research Laboratory Publication PRWG79-1, September 1973. 54 p, 5 fig, 3 tab, 123 ref. OWRR B-037-UTAH(1). 14-31-0001-3134-OWRR.

Descriptors: *Water policy, *Institutions, *Irrigation districts, *Management, Water allocation(Policy), Water Supply Development, Water Distribution(Applied), Political aspects, Legal aspects, Water law, *Utah, Planning, *Institutional restraints.
Identifiers: Wasatch Front(Utah), Municipal water companies, Conservancy districts, Private water companies.

The various water institutions in Utah are examined with respect to their history, purpose, legal status, organizational structure, management system, financial arrangement and service responsibility. The restraints that each type of institution has upon the overall state planning effort are identified and critically examined. Emphasis is given to those institutions in the Wasatch front area of Utah where pressures of urbanization and industrialization are increasing. Specific details are given for the mutual water companies, irrigation districts, private companies, municipal water companies, and conservancy districts in Utah and Weber Counties.
W74-04316

SOUTHWESTERN GROUNDWATER LAW: A TEXTUAL AND BIBLIOGRAPHIC INTERPRETATION,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 4B.
W74-04460

INTERNATIONAL DECADE OF OCEAN EXPLORATION.
National Science Foundation, Washington, D.C. Office for the International Decade of Ocean Exploration.
Publication NSF-34, Washington, D C, October 1971. 64 p, 29 fig, append.

Descriptors: *Oceanography, Research and development, *International commissions, *International waters.
Identifiers: *International decade of ocean exploration.

The International Decade of Ocean Exploration is dedicated to gaining sufficient knowledge about the ocean to provide: scientific capability leading to accurate long-term environmental forecasting; scientific background necessary for the rational management of the living and nonliving resources of the sea; warning when man's activities endanger the environment and himself; and the scientific basis necessary for the formulation of sound international decisions on marine affairs. The United States programs for the contribution to the initial phase of the International Decade of Ocean Exploration is described. (Knapp-USGS)
W74-04473

WHAT DO WE MEAN BY METROPOLITAN WATER MANAGEMENT INSTITUTIONS.,
Colorado State Univ., Fort Collins.
N. Wengert.
Water Resources Bulletin, Vol 9, No 3, p 512-521, June 1973. 24 ref. OWRR W-122(No 3183)(4).

Descriptors: Water resources, *Institutions, *Planning, *Organizations, Values, *Reviews, National Water Commission, *Institutional constraints, *Social values, *Cities, Urbanization.
Identifiers: Definition, Meaning, Institutional fragmentation, Norms, Usage, Literature review, Water resources council, Great Lakes Basin Commission.

Usages and meaning of the term 'institutions' are often unclear, and many conceptualizations exist. Among the findings of this state-of-the-art survey were that: (1) many used do not include careful definitions; (2) many users seemed unaware of the general, theoretical literature on institutions; (3) there was little consistency among uses, either in practical literature dealing with water problems, or in conceptual literature dealing with the theory of institutions; (4) some usages of the term were without significant meaning; (5) the term was often used as a king of 'black box' to account for behavioral, societal, or managerial factors recognized as being of possible relevance; (6) the term often was used as a synonym for 'organization' in the narrowest sense of administrative structure. Changes in institutions are frequently superficial unless they are related to fundamental changes in attitudes, perceptions, and expectations of the affected citizens. Institutions are not simply the current organizational pattern but include socio-political values (norms). The local water agency is not an institution, but the collectivity or structure around which are clustered the institutionalized means for planning, developing and managing water functions. A proposed definition is the structured result or outcome of a process by which values are articulated, arranged and communicated, having continuity over time, and influencing or controlling behavior of persons involved with it, who did not necessarily participate in formulating those values (norms). (Edwards - North Carolina)
W74-04498

STATE ENVIRONMENTAL MANAGEMENT, CASE STUDIES OF NINE STATES,
For primary bibliographic entry see Field 5G.
W74-04503

ENVIRONMENTAL QUALITY, THE FOURTH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY.
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-04504

6F. Nonstructural Alternatives

INSTITUTIONAL FRAMEWORK AFFECTING THE USE OF INLAND WETLANDS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 4A.
W74-04462

FLOOD PROOFING DECISIONS UNDER UNCERTAINTY: AN APPLICATION TO THE CONNECTICUT RIVER BASIN,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 6A.
W74-04463

6G. Ecologic Impact Of Water Development

A DETAILED INVESTIGATION OF THE SOCIOLOGICAL, ECONOMIC, AND ECOLOGICAL ASPECTS OF PROPOSED RESERVOIR SITES IN THE SALT RIVER BASIN OF KENTUCKY,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 2A.
W74-04310

STATE ENVIRONMENTAL MANAGEMENT, CASE STUDIES OF NINE STATES,
For primary bibliographic entry see Field 5G.
W74-04503

ENVIRONMENTAL QUALITY, THE FOURTH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY.
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-04504

MANAGING GROWTH IN A FRAGILE ENVIRONMENT: PROBLEMS OF THE ROCKY MOUNTAIN STATES,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 6D.
W74-04505

REVIEWING ENVIRONMENTAL IMPACT STATEMENTS-POWER PLANT COOLING SYSTEMS, ENGINEERING ASPECTS,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5G.
W74-04555

7. RESOURCES DATA

7A. Network Design

LINEAR SYSTEMS TECHNIQUE APPLIED TO HYDROLOGIC DATA ANALYSIS AND INSTRUMENT EVALUATION: A CASE STUDY ON DATA FROM THE ALICE SPRINGS AREA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
For primary bibliographic entry see Field 2A.
W74-04470

TOPOLOGY OF RIVER SYSTEMS AND HYDROGRAPHIC INDICATOR STUDIES (TOPOLOGIYA RECHNYKH SISTEM I GIDROGRAFICHESKIYE INDIKATSIONNYYE ISSLEDOVANIYA),
For primary bibliographic entry see Field 2A.
W74-04578

7B. Data Acquition

REMOTE SENSING IN SAMPLING SITE LOCATION IN LAKES AND STREAMS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W74-04313

A GEOECOLOGICAL TERRAIN ANALYSIS OF DISCONTINUOUSLY FROZEN GROUND IN THE UPPER MACKENZIE RIVER VALLEY, CANADA,
Department of the Environment, Edmonton (Alberta).
For primary bibliographic entry see Field 2C.
W74-04354

IN SITU PHYSICOMECHANICAL PROPERTIES OF PERMAFROST USING GEOPHYSICAL TECHNIQUES,
Iron Ore Co. of Canada, Schefferville (Quebec).
For primary bibliographic entry see Field 2C.
W74-04399

THE APPLICATION OF SHALLOW SEISMIC METHODS TO MAPPING OF FROZEN SURFICIAL MATERIALS,
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 2C.
W74-04401

INVESTIGATION OF SAMPLING PERENNIALLY FROZEN ALLUVIAL GRAVEL BY CORE DRILLING,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04402

POTENTIAL USE OF AIRBORNE DUAL-CHANNEL INFRARED SCANNING TO DETECT MASSIVE ICE IN PERMAFROST,
Development and Resources Transportation Co., Silver Spring, Md.
L. A. LeSchack, F. H. Morse, W. R. Brinley, Jr., N. G. Ryan, and R. B. Ryan.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 542-549, 1973. 6 fig, 10 ref.

Descriptors: *Permafrost, *Frozen ground, *Ice, *Remote sensing, *Arctic, Frozen soils, Infrared radiation, Temperature, Surveys, Mapping, Aerial photography.

Remote sensing can detect the thermal effects on the surface of ice as they are manifested in the upper 2.5c3 m of permafrost. This is borne out by field work. Predawn imagery appeared to have the greatest significant information. Polygons undetected by conventional reconnaissance means are detected by IR scanning. The existence of polygons, with their associated ice wedges, may be determined with greater confidence than heretofore possible in areas of discontinuous permafrost or in areas where there is no visible surface expression. Dual-channel IR scanning offers even greater capabilities of identifying such ice masses. By obtaining a product of the two signals and mapping the resultant signal, images of polygonal structures appear to be enhanced significantly. By taking a ratio of the same two signals, imagery approaching an emissivity ratio map is produced in which the temperature function is significantly attenuated. A comparison of the product and ratio maps suggests that the polygonal structures seen are thermal anomalies and not anomalies due to surface emissivity change. (See also W74-04346) (Knapp-USGS)
W74-04403

MASS SPECTROMETRY AND INHOMOGENEOUS ION OPTICS,
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 5A.
W74-04475

AIR POLLUTION MEASUREMENTS FROM SATELLITES,
General Dynamics, San Diego, Calif. Convair Aerospace Div.
For primary bibliographic entry see Field 5A.
W74-04485

SCANNING ELECTRON MICROSCOPY OF FIXED, FROZEN, AND DRIED PROTOZOA,
Illinois Univ., Urbana. Dept. of Zoology.
E. B. Small, and D. S. Marszalek.
Science, Vol 163, p 1064-1065, March 7, 1969. 8 fig, 9 ref. OWRR B-028-Ill (2).

Descriptors: *Freeze drying, *Electron microscopy, *Sampling, *Protozoa, Freezing, Dehydration.
Identifiers: *Scanning electron microscopes.

Selected protozoa were examined with a scanning electron microscope. The natural shape of the body and surface organelles were revealed. Chemical fixation and freeze-drying techniques described permit a new approach to the study of protozoa. (Knapp-USGS)
W74-04497

CENTO SEMINAR ON THE APPLICATION OF REMOTE SENSORS IN THE DETERMINATION OF NATURAL RESOURCES.
Central Treaty Organization, Ankara (Turkey).
Proceedings of Seminar on the Application of Remote Sensors in the Determination of Natural Resources; Ankara, Turkey, November 10-13, 1971: Office of the U.S. Economic Coordinator for Central Treaty Organization Affairs, Ankara, Turkey, 1972. 179 p.

Descriptors: *Remote sensing, *Hydrology, *Water resources, Hydrogeology, Data collections, Mapping, Water resources development, Satellites(Artificial), *Natural resources.
Identifiers: *CENTO.

CENTO sponsored this Seminar on the Application of Remote Sensors in the Determination of Natural Resources. The fast, accurate, and timely acquisition of multidisciplinary data from space platforms will facilitate a better monitoring of time-dependent events such as land utilization, crop vigor, salinization, groundwater fluctuations, coastal line denudation, and erosion control. The scientific and technological communities of the CENTO region are in a position to deal effectively with the complexities of modern technology. The seminar was held in Ankara, Turkey from Wednesday, November 10 to Saturday, November 13, 1971. (See W74-04568 thru W74-04570) (Knapp-USGS)
W74-04567

POSSIBLE APPLICATION OF REMOTE SENSING FOR UNDERGROUND WATER EXPLORATION IN TURKEY,
State Hydraulic Works, Ankara (Turkey). Dept. of Hydrographic Mapping and Photo Geology.
N. Atuk.
In: Proceedings of CENTO Seminar on the Application of Remote Sensors in the Determination of Natural Resources; Ankara, Turkey, November 10-13, 1971: Office of the U.S. Economic Coordinator for Central Treaty Organization Affairs, p 54-56, 1972.

Descriptors: *Remote sensing, *Hydrogeology, Surveys, Mapping, Satellites(Artificial), Data collections, *Groundwater, *Exploration.
Identifiers: *Turkey.

In 1952, a small groundwater office was formed for the studies of exploration, development, control, and determination of quality and quantity of groundwater in Turkey. Groundwater investigations are made by photo interpretations to obtain hydrologic features, thus decreasing the amount of field work necessary and obtaining nearly correct data results. The remote sensing studies undertaken by NASA are of interest to Turkey. Three large regions have been selected to: (1) evaluate the utilization of data obtained from space; (2) investigate the possibility of obtaining economically important results on some interpreted problems; (3) correlate and develop the technique of interpretation from the data obtained through field work, aircraft, and satellite; (4) examine streams and submarine springs with respect to tidal phenomena or deformations occurring along seashore lines; (5) investigate and follow the change of stream meanders, boundaries of surface water, and groundwater levels, and to investigate soil, vegetation, and moisture conditions; (6) follow exposure of the vegetation cover in time; and (7) examine the matters in relation to geological problems of Turkey. (See also W74-04567) (Knapp-USGS)
W74-04568

GROUNDWATER INVESTIGATION AND MANAGEMENT IN IRAN,
Ministry of Water and Power, Tehran (Iran).
J. Miri-Lavasani.
In: Proceedings of CENTO Seminar on the Application of Remote Sensors in the Determination of Natural Resources; Ankara, Turkey, November 10-13, 1971: Office of the U.S. Economic Coordinator for Central Turkey Organization Affairs, p 74-75, 1972.

Descriptors: *Groundwater, *Data collections, *Remote sensing, *Hydrogeology, Investigations, *Subsurface investigations.
Identifiers: *Iran.

Groundwater studies in Iran are briefly outlined, and the uses of remote sensing in these studies are described. The investigations are in 38 regions covering a total area of more than 80,000 sq km. Data are collected from over 10,800 qanats, 9,000 deep wells, 18,850 shallow wells, 1,900 springs, and 3,000 observation wells.(See also W74-04567) (Knapp-USGS)
W74-04569

OPERATIONAL AND EXPERIMENTAL REMOTE SENSING IN HYDROLOGY,
Geological Survey, Washington, D.C. Office of Remote Sensing.
M. Deutsch.
In: Proceedings of CENTO Seminar on the Application of Remote Sensors in the Determination of Natural Resources; Ankara, Turkey, November 10-13, 1971: Office of the U.S. Economic Coordinator for Central Treaty Organization Affairs, p 95-105, 1972. 11 fig, 1 tab, 6 ref.

Descriptors: *Remote sensing, *Hydrology, *Water resources, Hydrogeology, Data collections, Mapping, Water resources development, Satellites(Artificial).

Both dynamic and nondynamic hydrologic phenomena can be investigated and better understood through the use of remote-sensing techniques. Operational techniques utilizing aircraft and/or spacecraft data provide qualitative observations and quantitative measurements in three modes--spatial, temporal, and spectral. Among the operational applications of remote sensing to hydrology are flood plain mapping, location and description of geologic structures controlling groundwater movement, identification of phreatophytes, monitoring of water losses and groundwater, and thermal infrared studies. Many experimental applications of remote sensing to hydrologic phenomena have been proposed for the Earth Resources Technology Satellite. These include experiments in playa lake dynamics, determination of density and distribution of phreatophytes, flood plains and wetland mapping, and spring runoff forecasting. Such hydrologic studies will yield significant benefit to worldwide water resources management programs by providing a data base for future planning and development. (See also W74-04567) (Knapp-USGS)
W74-04570

RADIO DEPTH-SOUNDING ON MEIGHEN AND BARNES ICE CAPS, ARCTIC CANADA,
Department of the Environment, Ottawa, (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2C.
W74-04571

DETERMINATION OF SOIL MOISTURE BY REMOTE SENSING TECHNIQUES (OPREDELENIYE VLAZHNOSTI POCHVY DISTANTSIONNYMI AEROKOSMICHESKIMI METODAMI),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 2G.
W74-04576

WATER RESOURCES APPLICATIONS,
Geological Survey, Rolla, Mo. Water Resources Div.
J. F. Daniel.
In: Proceedings of Seminar in Applied Remote Sensing, May 8-12, 1972, Des Moines, Iowa: Iowa Geological Survey Public Information Circular No 3, p 176-181, September 1972. 1 tab.

Descriptors: *Remote sensing, Hydrogeology, *Aerial photography, Satellites(Artificial), Water resources, Mapping, *Surveys, Groundwater movement, Water yield improvement.

Small scale multispectral photography may be considered an important tool for hydrology. The imagery may be useful for determining possible locations of large groundwater quantities, studying groundwater movement, determining stream gaging location, and locating optimal placement of dam sites. (Knapp-USGS)
W74-04584

ANALYTICAL TECHNIQUES FOR THE DETERMINATION OF PETROLEUM CONTAMINATION IN MARINE ORGANISMS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W74-04594

HYDROLOGIC INVESTIGATION AND DESIGN IN URBAN AREAS--A REVIEW,
Snowy Mountains Engineering Corp., Cooma (Australia).
For primary bibliographic entry see Field 2A.
W74-04597

A BACTERIOLOGICAL PRESSURE-RETAINING DEEP-SEA SAMPLER AND CULTURE VESSEL,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5A.
W74-04773

NUCLEONIC SEDIMENT CONCENTRATION GAUGE - COMPARISON OF TRANSMISSION AND SCATTERING MODES,
Bhabha Atomic Research Centre, Bombay (India), Isotope Div.
For primary bibliographic entry see Field 2J.
W74-04774

7C. Evaluation, Processing and Publication

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME I, PRINCIPLES OF COMPUTATION,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W74-04301

COMPLETE LISTING OF PROGRAM DESCRIBED IN OPTIMAL OPERATION OF MULTI-RESERVOIR WATER RESOURCES SYSTEMS,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 4A.
W74-04315

A REFRACTION STUDY AND PROGRAM FOR PERIODIC WAVES APPROACHING A SHORELINE, AND EXTENDING BEYOND THE BREAKING POINT,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 8B.
W74-04340

A GENERAL SOLUTION FOR THE TWO-DIMENSIONAL, TRANSIENT HEAT CONDUCTION PROBLEM IN PERMAFROST, USING IMPLICIT, FINITE DIFFERENCE METHODS,
Brown and Root, Inc., Houston, Tex.
For primary bibliographic entry see Field 2C.
W74-04350

INDIRECT MAPPING OF THE SNOWCOVER FOR PERMAFROST PREDICTION AT SCHEFFERVILLE, QUEBEC,
McGill Univ., Schefferville (Quebec). McGill Sub-Arctic Research Lab.
For primary bibliographic entry see Field 2C.
W74-04356

SAMPLE DISTURBANCE AND THAW CONSOLIDATION OF A DEEP SAND PERMAFROST,
Woodward-Lundgren and Associates, Oakland, Calif.
For primary bibliographic entry see Field 2C.
W74-04387

MAPPING AND PREDICTING PERMAFROST IN NORTH AMERICA: A REVIEW, 1963-1973,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2C.
W74-04398

ELECTROMAGNETIC PROBING OF PERMAFROST,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04400

THE NEED OF GEOLOGICAL INVESTIGATIONS FOR THE DEVELOPMENT OF THE GROUND WATER RESOURCES OF THE REPUBLIC OF KOREA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W74-04466

QUANTITY AND CHEMICAL QUALITY OF LOW FLOW IN THE EAST FORK SAN JACINTO AND WEST FORK SAN JACINTO RIVERS NEAR HOUSTON, TEXAS, JUNE 24, 26, 1969,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 5B.
W74-04481

EFFECTS OF URBANIZATION ON FLOODS IN THE DALLAS, TEXAS, METROPOLITAN AREA,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4C.
W74-04483

EVALUATION AND SIMULATION OF CHEMICAL-QUALITY DATA FOR FIVE MONTANA SAMPLING STATIONS,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 2K.
W74-04484

SPECIAL ANALYSIS OF SHORT INERTIAL-INTERNAL WAVE RECORDS,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2E.
W74-04489

SURFACE-WATER AVAILABILITY, LAUDERDALE COUNTY, ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 2E.
W74-04494

RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF CIMARRON COUNTY, OKLAHOMA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 4B.
W74-04495

LAKES IN THE BOULDER-FORT COLLINS-GREELEY AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 2H.
W74-04496

VISCOSITY MEASUREMENTS OF WATER IN REGION OF ITS MAXIMUM DENSITY,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2K.
W74-04518

CENTO SEMINAR ON THE APPLICATION OF REMOTE SENSORS IN THE DETERMINATION OF NATURAL RESOURCES.
Central Treaty Organization, Ankara (Turkey).
For primary bibliographic entry see Field 7B.
W74-04567

OPERATIONAL AND EXPERIMENTAL REMOTE SENSING IN HYDROLOGY,
Geological Survey, Washington, D.C. Office of Remote Sensing.
For primary bibliographic entry see Field 7B.
W74-04570

RESERVOIRS OF EUROPE AND SOME ASPECTS OF THEIR CONSTRUCTION AND MULTIPURPOSE USE (VODOKHRANILISHCHA ZARUBEZHNOY YEVROPY I NEKOTORYYE VOPROSY IKH SOZDANIYA I KOMPLEKSNOGO ISPOL'ZOVANIYA),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 8A.
W74-04582

THE EFFECT OF COLLECTING TIME AND GRAIN SIZE ON THE SAMPLING OF STREAM SEDIMENTS FOR GEOCHEMICAL MAPPING IN THE ST. CATHARINES AREA, ONTARIO,
Brock Univ., St. Catharines (Ontario). Dept. of Geological Sciences.
For primary bibliographic entry see Field 2J.
W74-04587

A NUMERICAL CLASSIFICATION OF SELECTED LANDSLIDES OF THE DEBRIS SLIDE-AVALANCHE-FLOW TYPE,
Macquarie Univ., North Ryde (Australia). School of Earth Sciences.
For primary bibliographic entry see Field 2J.
W74-04591

CHEMICAL QUALITY OF STREAMS, ALLEGHENY RIVER BASIN AND PART OF THE LAKE ERIE BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 2K.
W74-04593

GROUND-WATER DATA FOR HARRIS COUNTY, TEXAS: VOLUME I. DRILLERS' LOGS OF WELLS, 1905-71.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-04602

WATER QUALITY RECORDS FOR THE HUBBARD CREEK WATERSHED, TEXAS, OCTOBER 1969-SEPTEMBER 1972,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 5B.
W74-04606

THE ANALYSIS OF HARBOR AND ESTUARY SYSTEMS,
California Univ., Berkeley. Coll. of Engineering.
For primary bibliographic entry see Field 2L.
W74-04745

AN INEXPENSIVE S.T.D. DATA LOGGING SYSTEM,
National Inst. of Oceanography, Wormley (England).
G. F. Morrison.
Deep-Sea Research, Vol 20, No 7, p 665-668, July 1973. 4 fig, 1 ref.

Descriptors: *Data storage and retrieval, Salinity, Temperature, Depth, Analog computers, Electronic equipment.
Identifiers: *Tape recorders.

An inexpensive and convenient method is described for storing and retrieving frequency modulated signals in the audio frequency band. The signal is recorded on one channel of a

stereophonic tape with a crystal derived clock frequency on the other. During retrieval the clock frequency is increased in a phase locked loop and is used as an external standard for a commercial counter/timer which measures the period of the signal in terms of this reference. The system has been used to record salinity, temperature and depth data from the Plessey Environmental System instrument, and this application is discussed. (Mortland-Battelle)
W74-04772

IDENTIFICATION OF BACTERIA BY COMPUTER: THEORY AND PROGRAMMING,
Central Public Health Lab., London (England). National Collection of Type Cultures.
For primary bibliographic entry see Field 5A.
W74-04791

CHARACTERISTICS OF STREAMFLOW AT GAGING STATIONS IN THE LOUP RIVER BASIN, NEBRASKA,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 2E.
W74-04794

SURFACE- AND GROUND-WATER CONDITIONS DURING 1959-61 IN A PART OF FLETT CREEK BASIN, TACOMA, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2E.
W74-04796

HYDROLOGIC DATA FOR SMALL RURAL CATCHMENTS IN AUSTRALIA, 1973,
Snowy Mountains Engineering Corp., Cooma (Australia).
For primary bibliographic entry see Field 2E.
W74-04842

MISSISSIPPIAN AQUIFER OF IOWA,
Geological Survey, Iowa City, Iowa.
P. J. Horick.
Iowa Geological Survey Miscellaneous Map Series 3, 1973. 3 sheets, 13 fig, 4 tab, 3 map, 10 ref.

Descriptors: *Hydrogeology, *Aquifers, *Iowa, *Hydrologic data, Maps, Data collections, Water quality, Water levels, Water yield, Groundwater.
Identifiers: *Mississippian aquifer(Iowa).

The purpose of this 3-sheet atlas is to present information on the occurrence, movement, availability, use, and chemical quality of water from the Mississippian aquifer in Iowa. Included is a brief description of the physical characteristics and spatial relations of the rocks that contain the water. Also discussed and evaluated are the areas of high pollution hazard to this and underlying aquifers. The Mississippian aquifer underlies about 60% of the State, but in only about 15% of this area can the aquifer be considered a major source of potable water. This area comprises all or parts of 10 counties in the north-central part of the Mississippian outcrop, where the aquifer will yield moderate to large supplies of good to excellent quality water to wells. Estimates of recharge and storage in that region indicate that many times the current withdrawal rate of about 12 mgd can be developed from the aquifer. Elsewhere, the aquifer yields either small quantities of moderately to highly mineralized water (subcrop area), or small to moderate quantities of fair to good quality water (southeast outcrop area). Additional supplies probably can be developed in both areas. Waste-disposal sites in the outcrop area of the aquifer would be best located where the glacial drift is thick or has very low permeability. A potential contamination hazard to the underlying Cambrian-Ordovician aquifer exists in the subcrop area of the Mississippian aquifer. In that area the Mississippian aquifer contains highly mineralized water. (Knapp-USGS)
W74-04843

8. ENGINEERING WORKS

8A. Structures

MECHANICAL BYPASSING OF LITTORAL DRIFT AT INLETS,
Corps of Engineers, Washington, D.C. Beach Erosion Board.
For primary bibliographic entry see Field 2L.
W74-04337

APPROACHES TO STORMWATER MANAGEMENT,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5A.
W74-04458

RESERVOIRS OF EUROPE AND SOME ASPECTS OF THEIR CONSTRUCTION AND MULTIPURPOSE USE (VODOKHRANILISHCHA ZARUBEZHNOY YEVROPY I NEKOTORYYE VOPROSY IKH SOZDANIYA I KOMPLEKSNOGO ISPOL'ZOVANIYA),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
V. A. Sharapov.
Vodnyye Resursy, No 3, p 175-186, 1973. 5 fig, 3 tab, 44 ref.

Descriptors: *Europe, *Reservoirs, *Multiple-purpose reservoirs, *Reservoir construction, Reservoir design, Reservoir sites, Reservoir operation, Reservoir storage, Maps.
Identifiers: USSR.

The number, basic parameters, dynamics of construction, and geographical distribution of reservoirs in Europe, excluding the Soviet Union, are tabulated and mapped. The economic importance of these reservoirs and general aspects of reservoir design, construction, and operation are examined. (Josefson-USGS)
W74-04582

APPLICATION OF FLUORESCENT COATED SAND IN LITTORAL DRIFT AND INLET STUDIES,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
For primary bibliographic entry see Field 2L.
W74-04616

THE ATLANTIC COAST OF LONG ISLAND,
Army Engineer District, New York.
F. L. Panuzio.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 2, Part 4, Chap 77, p 1222-1241, 1969. 7 fig, 2 tab, 15 ref, 1 plate.

Descriptors: *Sea level, *Storms, *Littoral drift, *Shore protection, *New York, Coasts, Barriers, Inlets(Waterways), *Sediment transport, *Coastal engineering, *Design criteria.
Identifiers: Long Island(NY).

The south shore of Long Island, located on the northeast coast of the United States, consists of 120 miles of headlands and barrier beach which is breached by inlets that interconnect the coastal bays with the Atlantic Ocean. The shore is subject to severe changes due to constant attack of the ocean, rising level of the ocean and severe storms. The predominant, east to west littoral drift moves from 300,000 to 600,000 cubic yards of sand along the shore annually. The affected area encompasses a million people and is valued at $2.5 billions. Improvements have been authorized for 110 miles of shore, and involve sandfill, feeder beaches, groins, jetties, sand bypassing, and inlet barriers. The estimated cost for the entire shore improvement is $188 million. The annual charges are about $10 million. The annual benefits are $16 million. The implementation of the authorized work includes the design and model testing of several sections and the completed work in several sections, such as sandfill, feeder beaches, and groins. The completed work shows considerable effect on shore processes. Overall evaluation must await completion of the total improvement in an integral section of the shore. (Sinha-OEIS)
W74-04626

8B. Hydraulics

THE SOLITARY WAVE,
R. L. Wiegel.
In: Oceanographical Engineering, Chapter 3, p 65-76, 1964. 19 fig, 24 ref. Prentise Hall, New York, Price, $24.75.

Descriptors: *Waves(Water).
Identifiers: *Solitary waves, *Cnoidal waves, *Shoaling.

The solitary wave is not oscillatory in character in that there is no reversal of flow of the water particles because it is a wave of translation; nor is there a trough, all of the wave being above the undisturbed water level. The solitary wa ve is said to be a limiting case of cnoidal wave. Explanations are given on processes in shoaling water, on reflection- the Mach-Stem effect, and finally on diffraction. (Sinha-OEIS)
W74-04326

MIXING PROCESSES,
For primary bibliographic entry see Field 5B.
W74-04327

MEAN DIRECTION OF WAVES AND OF WAVE ENERGY,
Leeds, Hill and Jewett Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 2J.
W74-04328

THE RELATIONSHIP BETWEEN WAVE ACTION AND BEACH PROFILE CHARACTERISTICS,
University Coll., London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W74-04331

WAVE EFFECT ON THE COAST FORMATION AND EROSION,
Construction Engineering Inst., Warsaw (Poland).
For primary bibliographic entry see Field 2J.
W74-04335

THEORETICAL FORMS OF SHORELINES,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
For primary bibliographic entry see Field 2J.
W74-04336

WAVES IN SHOALING WATER,
R. L. Wiegel.
In: Oceanographical Engineering, Chapter 7, p 150-179, 1964. 34 fig, 41 ref. Prentise Hall, New York, NY, Price: $24.75.

Descriptors: Coasts, *Waves(Water), *Shallow water, *Refraction(Water waves), Reflection, Surf, *Shoals.
Identifiers: *Shoaling, *Breaking waves.

Following a statement on the transformation of uniform periodic waves, the transformation of irregular waves is examined. The linear least-

squared method of prediction of wave motion is reviewed. Wave refraction techniques are usually valuable in obtaining reliable quantitative information for large portions of the area under study and will give qualitative information about a complex area. Wave refraction is applied in the case of a straight shore with parallel contours, in the case of islands and shoals with concentric circular contours, and the region of a caustic. Instructions are given on the graphical construction of refraction diagrams by the wave-front method for long-crested waves, and by use of orthogonals. The advantages and disadvantages of the use of both methods are set forth. Breakers, surf and multi-crested waves, also are discussed. (Sinha-OEIS)
W74-04338

SHORES AND SHORE PROCESSES,
For primary bibliographic entry see Field 2L.
W74-04339

A REFRACTION STUDY AND PROGRAM FOR PERIODIC WAVES APPROACHING A SHORELINE, AND EXTENDING BEYOND THE BREAKING POINT,
Delaware Univ., Newark. Coll. of Marine Studies.
B. S. L. Smith, and F. E. Camfield.
Available from NTIS as AD-756 636 for $3.00 paper copy, $1.45 microfiche. Technical Report No. 16, CMS No. 2 EN-071, November 1972. 124 p, 43 fig, 7 tab, 25 ref, 6 append. ONR-N00014-69-A0407.

Descriptors: *Coasts, *Refraction(Water waves), *Waves(Water), *Shallow water, *Computer programs, Shoals, *Delaware.
Identifiers: Breaker zone, Shoaling zone, *Cape Henlopen(Del.).

The study extends the computerized wave refraction process beyong the breaking zone and over shoaling areas. It applies experimental data to the irregular conditions encountered in shoaling areas in such a way that a manageable and reliable program is achieved. This is done by means of graphical interpretation and mathematical treatment. The program was run for three conditions of wave period and a constant deep water wave height of 10 feet. The chosen direction was from the E.S.E., being one of predominant wind for the Cape Henlopen area. The program refracts successfully outside and beyond the shoaling area, and estimates reforming wave heights and wavelengths of a reasonable order. These compute all the way to the shoreline to give the wavelengths and wave heights at the beach, thus providing valuable information for design purposes. The program was also run over an artificially constructed breaker zone of exaggerated undulation, and ran successfully. Program details and results are given. (Sinha-OEIS)
W74-04340

MODIFICATION OF NEARSHORE CURRENTS BY COASTAL STRUCTURES,
United States Lake Survey, Detroit, Mich.
J. H. Saylor.
Available from NTIS as AD-646 820, for $6.00 paper copy, $1.45 microfiche. Miscellaneous Paper No. 66-1, June 1966. 14 p, 9 fig, 9 ref.

Descriptors: *Great Lakes, Lakes, *Coastal structures, *Harbors, *Currents(Water), *Circulation, Breakwaters, Lake Superior, Lake Erie, Lake Michigan, Shear stress, Winds, Water circulation, *Wind tides.
Identifiers: Longshore currents, Flushing, Nearshore, Wind driven currents.

The results of water current studies conducted along the shores of Lakes Superior, Michigan, and Erie are described. Studies were made at various harbor locations to establish current magnitudes and patterns within the harbors and in the adjacent coastal areas, and to relate the measured currents with the causitive forces. Current patterns measured at three harbors in which the circulation is largely controlled by currents flowing along the shores of the Great Lakes are presented. The current patterns are determined by the configuration of the breakwaters and the strength and direction of coastal flow. It appears certain that with adequate information on the nearshore-current and long-wave climates, the pattern of circulation can be forecast before construction of new or modification of existing coastal structures. This is of special importance on the Great Lakes not only to avoid adverse effects of the currents, but also to provide for adequate harbor flushing. The absence of significant astronomical tides in the lakes and the absence of other large-amplitude oscillations of water level makes interaction of the harbor with currents along the shore the most effective means of harbor flushing. The nearshore currents are driven chiefly by the shear stress of the wind, and both speed and direction of the currents are closely correlated with periods of high-energy input. The nearshore currents are certainly related to a wind-driven circulation of the entire lake basin. (Sinha-OEIS)
W74-04341

ANALYSIS OF THE PROPOSED LITTLE CHENA RIVER, EARTHFILLED NONRETENTION DAM, FAIRBANKS, ALASKA,
Corps of Engineers, Anchorage, Alaska.
For primary bibliographic entry see Field 8D.
W74-04412

LABORATORY EXPERIMENTS TO DETERMINE THE STRUCTURAL RESPONSE OF A VERTICAL PILE SUBJECTED TO WIND-GENERATED WATER WAVES,
Organization Massachusetts Univ., Amherst. School of Engineering.
E. J. Chacko, and J. M. Colonell.
Available from the National Technical Information Service as AD-759703 $3.00 in paper copy, $1.45 in microfiche. Report No UM-73-4, 1973. 121 p, 61 fig, 5 tab, 36 ref, 2 append.

Descriptors: *Offshore platforms, *Oil industry, *Design criteria, *Ocean waves, Winds, Laboratory tests, Methodology, Time series analysis, Computer programs, Drilling equipment.

An investigation was undertaken to determine the structural response of a vertical cylindrical column to excitation by wind-generated water waves. Structural bending moments at two positions on the column, as well as water surface elevations near the column, were monitored continuously. The time series representations of wave heights, bending moments, and resultant wave forces on the columns (reduced from the two moment records), were analyzed with the following objectives: Evaluation of statistical assumptions which are ordinarily made for such data; and development of insight for formulation of the most realistic and/or mathematically tractable assumptions on which to base stochastic models of these processes. With reference to a Morison equation formulation of the problem, the experiments were characterized by inertia-dominated resultant wave forces on the column. Significant results include verification of a Gaussian probability model for observations of structural bending moment and resultant wave force on the column. Peak-to-peak values of bending moment and wave force were observed to follow a Rayleigh probability model within the limits imposed by most practical situations. The transfer function which related resultant wave force to the incident wind-generated wave train was observed to be essentially constant over the dominant frequency band of the wave spectrum. A procedure is suggested for relating this type of laboratory experimentation to prototype structural design. (Woodard-USGS)
W74-04424

A LABORATORY INVESTIGATION OF FREE SURFACE FLOWS OVER WAVY BEDS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
A. F. H. Yuen, and J. F. Kennedy.
Report No 121, December 1971. 43 p, 37 fig, 5 tab, 23 ref. USGS Contract No 14-08-0001-11420.

Descriptors: *Streamflow, *Sediment transport, *Channel morphology, Open channel flow, Sedimentary structures, *Hydraulic models, Flumes, Roughness(Hydraulic).

A linearized, third-order analytical model developed to predict the amplitude ratio and phase shift between bed and surface waves of free-surface flows over sinusoidal beds was verified in a hydraulic model. Near resonance the surface configuration was complicated by the formation of hydraulic jump over each bed wave, and can only be analyzed within the framework of a nonlinear model. For selected experiments the spatial distributions of velocity, total head, bed pressure, and bed shear stress were also measured. The effects of bed curvature on the distributions of these quantities are discussed in the light of the findings of investigation of flow in wavy-walled pipes. The form of the velocity distribution varied widely along each wave, but conformed over much of the depth to the power law; an expression for the exponent in the velocity distribution relation was derived from energy and continuity considerations. (Knapp-USGS)
W74-04477

LAND DISPOSAL OF WASTE GASES: 1. FLOW ANALYSIS OF GAS INJECTION SYSTEMS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5E.
W74-04479

LAND DISPOSAL OF WASTE GASES: II. GAS FLOW FROM BURIED PIPES,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5E.
W74-04480

HYDRAULIC PERFORMANCE OF BRIDGES EXCAVATIONS AT BRIDGES,
Geological Survey, Jackson, Miss.
B. E. Colson, and K. V. Wilson.
Mississippi State Highway Department Report MSHD-RD-73-015-EB, September 1973. 37 p, 1 fig, 5 tab, 3 ref.

Descriptors: *Discharge(Water), *Scour, *Flood plains, Stage-discharge relations, *Mississippi, Open channel flow, Flow around objects, Hydraulic design, *Excavation, Alluvial channel, *Bridges.
Identifiers: Flow constrictions.

Excavation under bridges as a means of increasing their hydraulic capacity was studied by observing the stage and discharge through five bridge openings across a single flood plain. Three of the bridges had total downstream areas larger than the areas under the bridges before excavation, and increases in hydraulic capacity were indicated. The fourth bridge had a downstream subarea larger than the excavated areas near the abutments, and an increase in hydraulic capacity was also indicated. One bridge had a restricted area just downstream which acted as the control area, and no increase in hydraulic capacity was indicated. In one bridge, the maximum effective area is equal to the minimum area measured along the upstream to downstream perimeter of the excavation. After excavation, velocities were less uniform and were greater near the bottom than at the surface. (Knapp-USGS)
W74-04482

GALVESTON BAY HURRICANE SURGE STUDY: REPORT 2. EFFECTS OF PROPOSED BARRIERS ON TIDES, CURRENTS, SALINITIES, AND DYE DISPERSION FOR NORMAL TIDE CONDITIONS--APPENDIX B: CALIBRATION TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
R. A. Sager, and E. C. McNair, Jr.
Technical Report H-69-12, Report 2, Append B, March 1973. 41 p, 10 photo, 18 plate.

Descriptors: *Hydraulic models, *Harbors, *Texas, *Hurricanes, Coastal engineering, Shore protection, Surges, Flood protection.
Identifiers: *Galveston Bay.

A model test program was conducted to evaluate two proposed hurricane protection systems for Galveston Bay, Texas. Model structures allow the effects of two barrier plans on normal tide conditions to be evaluated in a distorted-scale model (1:60 vertically and 1:600 horizontally). A model structure of a 400-ft-wide by 55 ft navigation opening was developed for each plan. Model structures of a total of 108 60-ft-wide tidal passages varying in depth from -10 to -40 ft msl were developed for the one plan and a total of 160 60-ft-wide tidal passages at depths of -6 and -12 ft msl were developed for another plan. (Knapp-USGS)
W74-04573

WATER PROBLEMS OF THE TISZA RIVER IN HUNGARY AND COOPERATION AMONG TISZA BASIN COUNTRIES IN THE FIELD OF WATER MANAGEMENT (VODNYYE PROBLEMY REKI TISY V VENGRII I SOTRUDNICHESTVO STRAN BASSEYNA TISY V OBLASTI VODNOGO KHOZVAYST VA),
For primary bibliographic entry see Field 4A.
W74-04574

WAVE ACTION AND BREAKWATER DESIGN, HAMLIN BEACH HARBOR, NEW YORK,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
C. W. Brasfeild.
Available from NTIS, Springfield, Va 22151 as AD-766 738, Price $3.00 printed copy, $1.45 microfiche. Technical Report H-73-13, August 1973. 34 p, 4 fig, 6 plate, 7 photo, 1 tab, 5 ref.

Descriptors: *Harbors, *Lake Ontario, *New York, *Breakwaters, *Hydraulic models, Waves(Water), Coastal engineering.

A hydraulic model investigation was made of proposed harbor facilities at Hamlin Beach State Park, Lake Ontario, New York, to determine the most economical breakwater arrangement consistent with the provision of satisfactory entrance conditions and adequate protection to moored boats within the harbor. A wave machine and electrical wave height measuring and recording apparatus were utilized in model operation. The breakwater proposed for the west side of the entrance channel could be reduced in length by 100 ft without sacrificing the full protection desired for the entrance and inner harbor, and a reduction in length of another 100 ft would not seriously impair the desired protection. (Knapp-USGS)
W74-04588

AN ANALYTICAL STUDY OF A COILED-PIPE HEAT SINK,
Cold Regions Research and Engineering Lab., Hanover, N.H.
A. Zehnder, Y. C. Yen, R. E. Perham, and W. F. Quinn.
Special Report 195, November 1973. 33 p, 10 fig, 5 tab, 4 ref, append.

Descriptors: *Cryology, *Heat exchangers, *Heat transfer, *Waste disposal, Thermodynamics, Soil physics, Geothermal studies.
Identifiers: *Heat sinks.

An analytical study was conducted to determine the practicality of using a buried closed-loop, small-diameter coiled-pipe heat sink instead of a reservoir-type sink for emergency disposal of waste heat. The analysis was broadly based to permit application to a variety of soil types, mean ground temperatures, heat rejection rates, coolant water flow rates, pipe sizes, coil surface areas and coil spacings. The intent of the study was to present a problem-solving technique that would be useful to a design engineer faced with considering the use of a buried coiled pipe to dissipate a rather large amount of heat to the ground during a very limited period. The feasibility of such a system was found to be highly dependent upon the length of pipe required and the installation layout requirements for such a pipe network. (Knapp-USGS)
W74-04589

STUDY OF BEACH WIDENING BY THE PERCHED BEACH CONCEPT, SANTA MONICA BAY, CALIFORNIA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. E. Catham, Jr., D. D. Davidson, and R. W. Whalin.
Technical Report H-73-8, June 1973. 47 p, 10 fig, 17 tab, 24 photo, 14 plate, 20 ref, append.

Descriptors: *Beach erosion, *Coastal engineering, *California, *Hydraulic models, Shore protection.
Identifiers: *Santa Monica Bay(Calif).

Hydraulic model studies of beach erosion were conducted to aid in determining the technical feasibility and optimum design factors of the perched beach concept for widening the existing beach to provide right-of-way for a freeway along a portion of the Santa Monica Bay coastline. An undistorted, three-dimensional, fixed-bed model (scale 1:100) was used to determine the effect of the perched beach on rip currents. A distorted-scale (1:100 horizontal, 1:50 vertical), two-dimensional, movable-bed model was used to estimate the amount of sand which might be lost seaward over the toe structure due to normal and storm wave actions and to determine the optimum crown elevation of the submerged structure and the length of stone riprap apron required to reduce the seaward migration of sand to a minimum. An undistorted, two-dimensional model (scale 1:30) was used to determine the structural design of the proposed rubble-mound toe structure for various depths. Installation of the perched beach in the model had no adverse effect on rip currents and reduced rip current velocities about 20% for the configuration tested. Normal wave action (waves expected to occur a high percentage of the time) on the perched beach will cause no appreciable loss of beach fill. For the larger storm waves of any significant duration, a large net seaward loss of fill material can be expected. (Knapp-USGS)
W74-04603

WAVE REFLECTION AND TRANSMISSION IN CHANNELS OF VARIABLE SECTION,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Civil Engineering.
E. L. Bourodimos, and A. T. Ippen.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 13, p 195-212, 1969. 10 fig, 11 ref.

Descriptors: *Waves(Water), *Channels, *Shallow water.
Identifiers: *Wave steepness, Wave frequencies, *Wave reflection, Wave transmission.

Reflection and transmission phenomena were investigated in a laboratory channel for transitions of linearly varying depth and/or width terminating in channels of reduced cross-section. Upstream wave characteristics were varied from deep to shallow water waves by changing wave frequencies, amplitudes and channel depths over a wide spectrum of conditions. Experimental values were corrected to correspond to transmission in an endless channel. The reflection and transmission coefficients are given as functions of the pertinent dimensionless parameters such as group velocity ratio, channel depth ratio and wave steepness. Associated wave energies were also evaluated. (Sinha - OEIS)
W74-04614

FIELD INVESTIGATION PRACTICES OF COASTAL STUDIES IN JAPAN,
Tokyo Univ. (Japan).
For primary bibliographic entry see Field 2L.
W74-04625

HYDRAULIC MODEL EXPERIMENT ON THE DUFFUSION DUE TO THE COASTAL CURRENT,
Kyoto Univ. (Japan). Disaster; Prevention Research Inst.
For primary bibliographic entry see Field 5B.
W74-04628

USE OF A COMPUTATIONAL MODEL FOR TWO-DIMENSIONAL TIDAL FLOW,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 2L.
W74-04631

ZONE OF FLOW ESTABLISHMENT FOR ROUND BUOYANT JETS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-04657

ON THE STABILITY OF LAMINAR PLUMES: SOME NUMERICAL SOLUTIONS AND EXPERIMENTS,
Cornell Univ., Ithaca, N.Y. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5B.
W74-04662

CONVECTIVE HEAT TRANSFER TO WATER CONTAINING BUBBLES: ENHANCEMENT NOT DEPENDENT ON THERMOCAPILLARITY,
Oxford Univ. (England). Dept. of Engineering Science.
D. B. R. Kenning, and Y. S. Kao.
International Journal of Heat and Mass Transfer, Vol 15, No 9, p 1709-1716, 1972, 10 fig, 11 ref.

Descriptors: Fluid mechanics, *Entrainment, *Heat transfer, *Shear, *Capillary action, *Water temperature, Hydraulics, Flow, Liquids, Gases, Boundary layers, Surface tension, Reynolds number, Laboratory tests, Data collection, Heat flux, Surfactants, Vortices, Turbulence.
Identifiers: *Thermocapillary flows.

Improvements in the heat-transfer coefficient of up to 50% occurred in the presence of small quantities of gas but the improvements were independent of heat flux over a range of 20-300 KW/square meter, indicating that thermocapillary flows made negligible contribution to the heat transfer process. Experiments were performed in which the surface tension of water in the apparatus remained within 0.2 degrees/cm of the value for pure water. An upstream injection of gas bubbles also increased the heat transfer coefficient by up to 50%. The increase depends on the gas flow rate and liquid phase Reynolds number but not on heat flux. A possible mechanism for the increase is secondary flow production by the interaction of bubbles with shear flow near the wall. (Jerome-Vanderbilt)
W74-04664

ANALYTICAL METHODS OF SOLUTION OF CONJUGATED PROBLEMS IN CONVECTIVE HEAT TRANSFER,
Akademiya Navuk BSSR, Minsk. Inst. of Heat and Mass Transfer.
A. V. Luikov, V. A. Aleksashenko, and A. A. Aleksashenko.
International Journal of Heat and Mass Transfer, Vol 14, No 8, p 1047-1056, 1971. 2 fig, 14 ref.

Descriptors: *Heat transfer, Fluids, *Model studies, *Thermodynamic behavior, *Fluid mechanics, Hydraulics, Convection, Flow, Heat flow, Mathematical models, Thermal conductivity, Dimensional analysis, Water temperature.

A method for solution of convective heat transfer problems is presented. The method takes into account the heat propagation in the solid in contact with a moving fluid. This method is referred to as the solution of conjugated problems. The heat transfer in laminar fluid flow in circular and planar tubes was treated with allowance for dissipation of mechanical energy. In addition, both steady and unsteady-state heat transfer problems for flow of a compressible fluid past a plate are considered. In all cases heat transfer in the fluid is discussed in relation to the heat transfer in the solid wall. On the basis of the analysis of the solution a new criterion is introduced which characterizes the effect of thermo-physical properties of the wall on heat transfer. Examples are used for illustration of the proposed method. (Jerome-Vanderbilt)
W74-04667

FLOATING BREAKWATER PONTOON,
Reid, Middleton and Associates, Inc., Edmonds, Wash.; and Poly Sintering, Inc., Seattle, Wash. (Assignees).
J. O. Olsen, and G. A. Visser.
U.S. Patent No. 3,777,689, 4 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 917, No 2, p 514, December 11, 1973.

Descriptors: *Patents, *Shore protection, *Breakwaters, *Waves(Water), *Beach erosion, Pontoons, Hydraulic structures.
Identifiers: *Wave action.

A rectangular floating structure having a grid pattern of walls and openings is formed from a nested array of uniquely shaped molded plastic pontoon modules. The modules are thin walled molded plastic hollow pontoons comprising an upper portion with a recess to allow for nesting the pontoons in position with other similar pontoons, a rectangular center pollution with protuberant end sections, and protuberant side sections extending outward from the central portion perpendicular to the end sections. When nested, the modules collectively form a grid pattern of rectangular openings extending into the upper portion of the wave to dissipate wave action. (Sinha-OEIS)
W74-04711

SELECTED BIBLIOGRAPHY ON BEACH FEATURES AND RELATED NEARSHORE PROCESSES.
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2J.
W74-04728

EFFECT OF ENTRANCE ON SEICHE MOTION IN OCEAN PORTS,
Indian Inst. of Tech., Kharagpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W74-04743

WAVES GENERATED BY HORIZONTAL MOTION OF A WALL,
Army Coastal Engineering Research Center, Washington, D.C.
M. M. Das, and R. L. Wiegel.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 98, No WW1, Proceedings paper 8707, p 49-65, February 1972. 11 fig, 1 tab, 13 ref, 2 append.

Descriptors: *Faults(Geologic), *Landslides, *Earthquakes, *Waves(Water).
Identifiers: Surface waves, Wall motion, Linearized solutions, *Wall displacement, Solitary waves.

The purpose is to determine the range of conditions for which the theoretical calculations of Noda based upon linear wave theory may be useful to the design engineer for the problem of surface waves generated by a vertical wall moving horizontally through water. Emphasis is on the problem of surface waves generated by a horizontal tectonic displacement of a portion of an underwater escarpment due to the strike fault movement of a fault oriented approximately normal to the escarpment. Also discussed is the problem of predicting water waves generated by landslides into water, which may occur either vertically, inclined at an angle, or even horizontally over a portion of their travel. Also described is the problem of waves generated in a reservoir by the horizontal motion of a dam during an earthquake. The regions of wave characteristics indicated by Noda for the box drop problem approximately describe the gross characteristics of the waves generated in the range of experiments performed for the wall-motion problem. The linearized solution appears to be in reasonable agreement with experimental results for fairly small values of wall displacement (but not for the smallest values) and velocity. The predictions of the maximum elevation of the leading wave of the nonlinear waves by using the linearized solutions appear to be useful, provided the value is calculated for $x^* = 5$. (Sinha - OEIS)
W74-04760

PHENOMENA AFFECTING IMPROVEMENT OF THE LOWER COLUMBIA ESTUARY AND ENTRANCE,
Corps of Engineers, Portland, Oreg. Special Projects Investigation Section.
For primary bibliographic entry see Field 2L.
W74-04763

APPLICATION OF THE FINITE ELEMENT METHOD TO CONVECTION HEAT TRANSFER BETWEEN PARALLEL PLANES,
New South Wales Univ., Kensington (Australia).
A. O. Tay, and G. De Vahl Davis.
International Journal of Heat and Mass Transfer, Vol 14, No 8, p 1057-1069, 1971.

Descriptors: *Fluid mechanics, *Heat transfer, *Mass transfer, *Laminar flow, Hydraulics, Flow, Turbulence, Temperature, Thermal properties, Distribution, Hydrodynamics, Model studies, Mathematical models, Convection.
Identifiers: *Heat flux, Nusselt number.

Physical problems of the Poisson equation type have been solved numerically by the finite element method. Few attempts have been made to apply this method to problems involving transport phenomena. A problem of a fluid of constant properties flowing in steady, laminar motion between two infinite stationary parallel planes is considered. A determination of the temperature distribution and the axial variation of the local Nusselt number is made. The flow is hydrodynamically developed. The validity of the method is verified and some aspects of the method discussed. (Jerome-Vanderbilt)
W74-04765

THE FALLACY OF BAER'S LAW OR CORIOLIS' EFFECT ON THE MEANDERING OF RIVERS,
Karachi Univ. (Pakistan).
M. S. Quraishy.
Sind University Research Journal (Science Series) Vol 6, p 59-68, 1972. 3 fig, 8 ref.

Descriptors: *Meanders, *Coriolis force, Hydraulics, Mathematical studies, Hydrodynamics, *Rivers.
Identifiers: *Baer's law.

The problem of the effect of the earth's rotation on a water body at any latitude was analyzed mathematically. The deviating force, known in literature as Baer's Law or Coriolis' Effect, is too insignificant to give rise to river meandering or the antecedent and subsequent phenomena, which inevitably must be looked upon as problems falling in the domain of hydromechanics. (Knapp-USGS)
W74-04799

THE CALCULATION OF CRITICAL DISCHARGE VELOCITY OF STREAMS IN UNIFORM FLOW AND THE TRANSPORTED SEDIMENT SIZE,
For primary bibliographic entry see Field 2J.
W74-04800

SUSPENDED AND BEDLOAD SEDIMENT TRANSPORT IN THE SNAKE AND CLEARWATER RIVERS IN THE VICINITY OF LEWISTON, IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 2J.
W74-04846

8C. Hydraulic Machinery

BREEDER REACTORS: POWER FOR THE FUTURE,
A. L. Hammond.
Science, Vol 174, No 4011, p 807-809, November 19, 1971. 1 fig.

Descriptors: *Breeder reactors, *Nuclear reactors, *Fuels, Electric powerplants, Nuclear powerplants, Nuclear energy, Nuclear engineering, Thermal powerplants, Cooling water, Uranium radioisotopes.
Identifiers: *Sodium cooling, Plutonium, Thorium, Uranium.

Breeder reactors are so called because they produce more fuel than they consume. The prototypes are already in operation in France, Britain, and U.S.S.R. The attractiveness of breeder reactors lies in their ability to utilize thorium and the more naturally abundant form of juranium (238 U), which results in substantially lower fuel costs. The primary effort both in the United States and elsewhere is concentrated in a fast breeder design that will use liquid sodium as a coolant and heat transfer medium and a plutonium oxide as a fuel. AEC is also investigating a thermal breeder reactor that would be moderated with water. (Oleszkiewicz-Vanderbilt)
W74-04656

ECONOMIC POWER FROM GEOTHERMAL HEAT,
For primary bibliographic entry see Field 4B.
W74-04766

8D. Soil Mechanics

MECHANICAL PROPERTIES OF FROZEN GROUND UNDER HIGH PRESSURE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04375

EVALUATION OF IN SITU CREEP PROPERTIES OF FROZEN SOILS WITH THE PRESSUREMETER,
Ecole Polytechnique, Montreal (Quebec).
For primary bibliographic entry see Field 2C.
W74-04377

SHOCK-WAVE STUDIES OF ICE AND TWO FROZEN SOILS,
California Univ., Livermore.
For primary bibliographic entry see Field 2C.
W74-04378

THAW CONSOLIDATION OF ALASKAN SILTS AND GRANULAR SOILS,
Woodward-Lundgren and Associates, Oakland, Calif.
For primary bibliographic entry see Field 2C.
W74-04379

MECHANICAL PROPERTIES OF ROCKS AT LOW TEMPERATURES,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04380

SOUND AND SHOCK TRANSMISSION IN FROZEN SOILS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04383

PRACTICAL EXTENSIONS TO A THEORY OF CONSOLIDATION FOR THAWING SOILS,
Alberta Univ., Edmonton.
For primary bibliographic entry see Field 2C.
W74-04384

TRIAXIAL AND CREEP TESTS ON FROZEN OTTAWA SAND,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04386

VISCOELASTIC PROPERTIES OF FROZEN SOIL UNDER VIBRATORY LOADS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
H. W. Stevens.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 400-409, 1973. 11 fig, 1 tab, 11 ref.

Descriptors: *Soil strength, *Rheology, *Permafrost, *Viscosity, *Frozen soils, Porosity, Ice, Plasticity.
Identifiers: Viscoelastic properties of soils.

The viscoelastic properties of frozen soil may be determined by subjecting a cylinder of the soil to steady-state vibration and measuring the resonant frequency and amplitude ratio. Using the mass density and the length of the cylinder and applying linear viscoelastic theory and boundary conditions, the desired parameters can be evaluated. The modulus of saturated frozen soils decreases with increasing void ratio. The maximum modulus for a given saturated soil depends on its minimum void ratio and the soil type. The degree of ice saturation has maximum effect on the modulus, as maximum modulus occurs with 100% saturation and minimum modulus occurs when no ice is contained in the voids or a nonfrozen dry state. The modulus of frozen soil is about two orders of magnitude greater than the modulus of the same soil in the nonfrozen state. The damping coefficient is approximately equal to or slightly higher for frozen soil than for nonfrozen soil. The modulus of frozen soil decreases with increasing temperature, but the rate is small until temperature is higher than about -4 deg C. From -4 to 0 deg C, the rate of decrease of modulus sharply increases. (See also W74-04346) (Knapp-USGS)
W74-04388

SHEAR STRENGTH AT A THAW INTERFACE,
Alberta Univ., Edmonton.
For primary bibliographic entry see Field 2C.
W74-04390

ENGINEERING DESIGN AND CONSTRUCTION IN PERMAFROST REGIONS: A REVIEW,
Cold Regions Research and Engineering Lab., Hanover, N.H.
K. A. Linell, and G. H. Johnston.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 553-575, 1973. 190 ref.

Descriptors: *Permafrost, *Construction, *Reviews, *Design, Land use, Environment, *Cold weather construction, Cold regions, Arctic, Dam construction, Engineering, Road construction, Civil engineering, Excavation, Subsidence, Frost heaving, Soil mechanics, *Bibliographies.

In North America, development of the permafrost regions is advancing at a rapidly accelerating rate. This creates increasingly intense pressure to formulate engineering design and construction principles. Proper selection and investigation of a site or route for construction is important. Full-scale field tests are necessary. Design to insure preservation of the permafrost is the most commonly used approach for permanent construction. Spread footings, continuous footings, raft or mat foundations, or post and pad construction have been successfully used on thaw-unstable as well as thaw-stable permafrost. Thermal control usually consists of either a simple ventilation space between the structure and the ground surface or of duct systems. Construction of anchorages is difficult because of creep, thermal instability, and frost heave. Foundations for bridges or for port construction are difficult problems because the permafrost conditions are altered near and under the water. Significant laboratory and field work has been done over the past decade to investigate methods of penetration, excavation, and handling of frozen ground and ice, including frozen ore, and of underground construction. In very cold permafrost areas it is feasible to construct dams with permanent reservoir water storage, even with relatively pervious embankment materials, because seepage is sealed off by freezing of the embankment. It is within the technological state of the art to develop and make available the petroleum resources of land areas of the Arctic with acceptably low environmental impact. (See also W74-04346) (Knapp-USGS)
W74-04404

SOME PASSIVE METHODS OF CONTROLLING GEOCRYOLOGICAL CONDITIONS IN ROADWAY CONSTRUCTION,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04406

SETTLEMENT ASSOCIATED WITH THE THAWING OF PERMAFROST,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04408

THERMAL REGIME IN AN ARCTIC EARTHFILL DAM,
Cold Regions Research and Engineering Lab., Hanover, N.H.
C. W. Fulwider.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 622-628, 1973. 7 fig, 1 tab, 1 ref.

Descriptors: *Dams, *Dam design, *Permafrost, *Arctic, *Earth Dams, Dam construction, Freezing, Water storage, Water temperature.
Identifiers: *Greenland.

The Crescent Lake Dam is an earthfill embankment constructed near Thule Air Base, Grenland, to impound a dependable water supply for the base. It is one of very few such structures in the Arctic or Subarctic. The design of the dam was based on the premise that the soil in the central part of the embankment would remain frozen throughout the year, creating an impervious core section, and that the water surface elevation would remain below the top of the frozen portion of the dam. Two winters were required to establish a stable thermal regime in the original 3.6-m dam and about the same after increasing embankment height by about 2.4 m, although in both instances thawing beneath the crest was limited to about 1.8 m after only one winter. The limiting height for complete freezeback in one winter is in excess of 3.6 m, and perhaps as much as 6 m. For an earthfill dam of greater height, it is probable that construction in stages, over several years, would be necessary to ensure dependable natural freezeback of the core section if it is desired to achieve this freezeback before water is impounded. (See also W74-04346) (Knapp-USGS)
W74-04410

ANALYSIS OF THE PROPOSED LITTLE CHENA RIVER, EARTHFILLED NONRETENTION DAM, FAIRBANKS, ALASKA,
Corps of Engineers, Anchorage, Alaska.
W. George.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 638-648, 1973. 9 fig, 2 tab, 9 ref.

Descriptors: *Dams, *Dam design, *Permafrost, *Alaska, Dam construction, Thawing, Subsidence, Arctic, Flood control, Water storage, Water temperature, Earth dams.

A dam near Fairbanks, Alaska, will be located in an area in which the permafrost temperature is more marginal than that existing in the areas where such structures have been previously built with permafrost preservation in mind. The same requiremens exist, however, to protect the permafrost and, in fact, these are even more of a concern. Because of its use for temporary storage, a moderation and, in fact, control of the heat absorption into the dam from these impounded waters will result. This controlled and limited heat input is an important factor in even considering the design and construction proposed. Conservative calculations show that there exists more than a margin of safety from the heat input from such temporary and infrequent impoundments when balanced against heat loss. The more frequent floods will normally be of the spring snowmelt type with water temperature quite cold and the duration of the impoundment quite short. The less frequent flood, where water temperatures may be somewhat higher, will not be a problem. (See also W74-04346) (Knapp-USGS)
W74-04412

SOME EFFECTS OF SURFACE DISTURBANCE ON THE PERMAFROST ACTIVE LAYER AT INUVIK, N.W.T., CANADA,
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 4C.
W74-04413

CORPS OF ENGINEERS TECHNOLOGY RELATED TO DESIGN OF PAVEMENTS IN AREAS OF PERMAFROST,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 4C.

W74-04414

PERMAFROST PROTECTION FOR PIPELINES,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 2C.
W74-04415

PERMAFROST-RELATED ENGINEERING GEOLOGY PROBLEMS POSED BY THE TRANS-ALASKA PIPELINE,
Geological Survey, Menlo Park, Calif.
R. Kachadoorian, and O. J. Ferrians, Jr.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 684-687, 1973. 1 fig, 11 ref.

Descriptors: *Permafrost, *Pipelines, *Alaska, *Arctic, *Oil fields, Frozen ground, Frozen soils, Subsidence, Frost heaving, Thawing, Freezing.

The design, construction, and maintenance of the proposed trans-Alaska pipeline system in the permafrost region of Alaska poses special engineering problems. The severity of problems resulting from soil instability, differential settlement, and erosion of thawed soil depends on the type and ice content of the soil and the slope and drainage conditions. Soil instability, differential settlement, erosion, and disrupted surface and subsurface drainage can result in loss of support and rupture of the pipe. Consequently, the effects of thawing permafrost and of erosion must first be determined and then minimized or controlled by proper design, proper arctic and subarctic construction procedures, and an adequate monitoring system. Some potential effects are so serious that contingency plans must be devised. These actions are necessary in order to maintain the mechanical integrity of the pipeline and to avoid degradation of the adjacent terrain. (See also W74-04346) (Knapp-USGS)
W74-04416

STABILITY OF AN UNDERGROUND ROOM IN FROZEN GRAVEL,
Bureau of Mines, Spokane, Wash.
For primary bibliographic entry see Field 2C.
W74-04418

PERFORMANCE OF A WARM-OIL PIPELINE BURIED IN PERMAFROST,
Mackenzie Valley Pipeline Research Ltd., Calgary (Alberta).
G. H. Watson, R. K. Rowley, and W. A. Slusarchuk.
In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 759-766, 1973. 7 fig, 3 tab, 7 ref.

Descriptors: *Permafrost, *Pipelines, *Oil fields, *Thawing, *Subsidence, Frost heaving, Freezing, Arctic, *Canada.

To study the behavior of permafrost as a foundation material for a warm-oil pipeline, a 27-m test section of 0.61-m-diameter pipe was installed near Inuvik, N.W.T. The surrounding foundation material (ice-rich silty clay) was thawed by circulating oil at 71 deg C. During thawing of the foundation, excess pore pressures were recorded. In the upper layers, two of three piezometers indicated that the pore pressures dissipated rapidly. At greater depths, pore pressure rose to a maximum value and remained nearly constant during the testing period. Although the values of excess pore pressures are small, hydraulic gradient was developed at depth. Settlement measurements show variability over short distances. However, the amount of settlement was predicted within practical accuracy by using average values obtained from laboratory thaw-settlement tests. For the test section, oil was circulated at 71 deg C from the start of the test, whereas for the pipeline a buildup from 38 to 60 deg C in 5 years is proposed. Under full-scale operation, the slower heat buildup would result in lower pore pressures and slower settlement rates. (See also W74-04346) (Knapp-USGS)
W74-04423

QUICKCLAYS AS PRODUCTS OF GLACIAL ACTION: A NEW APPROACH TO THEIR NATURE, GEOLOGY, DISTRIBUTION AND GEOTECHNICAL PROPERTIES,
Leeds Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W74-04590

8F. Concrete

LABORATORY STUDY OF SELF-SEALING LIMESTONE PLUGS FOR MINE OPENINGS,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
For primary bibliographic entry see Field 5G.
W74-04559

8G. Materials

THE USE OF POLYURETHANE FOAM PLASTICS IN THE CONSTRUCTION OF EXPEDIENT ROADS ON PERMAFROST IN CENTRAL ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
N. Smith, R. Berg, and L. Muller.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973. p 736-745, 1973. 10 fig, 4 tab, 1 ref.

Descriptors: *Permafrost, *Road construction, *Arctic, *Insulation, Thermal insulation, Frost heaving, Thawing, *Plastics, *Alaska.
Identifiers: Polyurethane foam.

In the cold regions of the world, seasonally and permanently frozen soils present severe road construction and maintenance problems during winter and the thawing period. The use of as much as 1.0-3.0 m of granular materials to minimize or prevent deleterious freezing and thawing actions is common practice. In general, for expedient roads designed for short lives, such as those required for lumbering, mining and oil explorations, and military operations, this method is too time consuming; also, many areas lack sufficient quantities of granular materials for this practice. Road test sections incorporating foamed in-place polyurethane insulation of two densities were tested over a subgrade containing seasonally and permanently frozen high-moisture-content silt. On permafrost terrain similar to central Alaska, 10 cm of foam insulation is sufficient thickness to withstand 1,000 passes of a loaded dump truck having a maximum single wheel load of 2,415 kg. Additional use as an access road for lumbering, mining, and oil explorations, and military operations with wheel loads up to 5,000 kg could be handled for a minimum of one thaw season. Wood chips as a leveling course provided some insulation advantage over the gravel leveling course of approximately equal thickness. (See also W74-04346) (Knapp-USGS)
W74-04421

8I. Fisheries Engineering

FISHERY SURVEY CARRIED OUT AT LAKE BORULLUS, A. R. E., IN THE SPRING OF 1971, (IN CZECH),
Ceskoslovenska Akademie Ved, Brno. Ustav pro Vyzkum Obratlovcu.
For primary bibliographic entry see Field 2H.
W74-04643

FEEDING OF JUVENILE CARP CYPRINUS CARPIO L. IN THE ARAKUM BODIES OF WATER (DELTA OF THE TEREK RIVER) AT EARLY DEVELOPMENTAL STAGES, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Makhachkala (USSR).
For primary bibliographic entry see Field 2L.
W74-04649

MORPHOLOGY AND LIFE STYLE OF THE TURKESTAN GUDGEON GOBIO GOBIO LEPIDOLAEMUS KESSLER IN WATERS OF THE SUKHAN-DARYA BASIN, (IN RUSSIAN),
A. A. Amonov.
Vopr Ikhtiol. p 657-664. 1972.
Identifiers: Barbel, Carp, Gobio-Gobio-Gobio, Gobio-Gobio-Lepidolaemus, Gobio-Gobio-Nikolskii, *Gudgeon, Morphology, Turkestan, *USSR(Sukhan-Darya basin), *Fish reproduction, Fish behavior, *Fish diets.

G. gobio lepidolaemus was compared morphologically to G. gobio gobio and G. gobio nikolskii. Populations of G. gobio lepidolaemus from 4 different bodies of water differed sharply by up to 8 morphological features out of 22 studied. The fishes reached sexual maturity at 45-53 mm. They spawned from May-June and had a high reproductive capacity. Conditioning varied in different bodies of water. They competed with wild carp and barbel for food. Favorable feeding conditions and the almost complete absence of predators suggested that their numbers will increase.—Copyright 1973, Biological Abstracts, Inc.
W74-04650

PARASITE FAUNA OF CTENOPHARYN GODON IDELLA FROM POND- AN SPAWNING-NURSERY FISHERIES IN TH VOLGA DELTA, (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Astrakhan (USSR).
T. V. Astakhova, and G. A. Stepanova.
Parazitologiya. Vol 6, No 4, p 364-368. 1972 (English summary).
Identifiers: Amurotrema-Dombrowskajae, Balantidium-Ctenopharyngodonis, *Ctenopharyngodon Idella, Dactylogyrus-Lamellatus, Deltas, Faun *Fisheries, Nursery, *Parasite, Ponds, Sineragasilus-Major, Spawning, *USSR(Volga delta).

The parasite fauna of first yr brood, second brood, and fifth yr brood yearlings of C. idell from pond- and spawning-nursery fisheries wa studied in connection with the acclimatization phytophagous fishes of the Chinese complex in th Volga Delta. Parasites (18 spp.) were found i fishes. Four new species were brought into this r gion with C. idella, i.e., Balantidium ctenopharyn godonis, Dactylogyrus lamellatus, Amurotrem dombrowskajae, and Sinerogasilus major.—Cop right 1973, Biological Abstracts, Inc.
W74-04702

CONDUIT STRUCTURE FOR MIGRATIN FISH,
J. E. Raistakka.
U.S. Patent No. 3,772,891, 3 p, 7 fig, 5 ref; Offici Gazette of the United States Patent Office, V 916, No 3, p 857-858, November 20, 1973.

Descriptors: *Patents, *Fish migration, *Fi passages, *Conveyance structures, Engineeri structures, Dams, *Fish barriers, Migration *Conduits.

Migrating fish may circumvent a dam by use of conduit enabling their passage upstream a downstream. The conduit terminates in segmer projecting in a submerged manner outward in the river; the segments are flexible to a degree permit vertical positioning of the conduit ends f optimum fish ingress and egress. It is closed fr the atmosphere to prevent the addition of nitrog to the water passing through the conduit. A co stant gradient and constant flow facilitate fi passage. Spaced along the conduit are series

flow disrupting projections which cause the water to form areas of eddying water currents providing resting areas for the fish. Fish attracting substances are fed into the conduit water to help overcome the natural tendency of fish to shy away from the entry of the conduit. (Sinha-OEIS)
W74-04715

PINK AND CHUM SALMON CULTURE,
Oregon State Univ., Corvallis.
W. J. McNeil.
Available from NTIS, Springfield, Va. 22151 COM-72-11056 for $3.00 printed copy; $1.45 microfiche. Completion Report to NOAA, National Marine Fisheries Service, July 1970. 4 p, 3 photo. AFC-43.

Discriptors: *Fish hatcheries, *Oregon, Fish handling facilities, *Pink salmon, *Chum salmon, Fish management.
Identifiers: *Netarts Bay(Oreg).

A prototype pink and chum salmon hatchery is being tested at Netarts Bay, Oregon, by Oregon State University working in cooperation with the National Science Foundation's Sea Grant Program, the Fish Commission of Oregon, and the U.S. Bureau of Commercial Fisheries. The hatchery is designed to simulate conditions in a good quality natural spawning bed to produce robust fry which retain natural behavioral traits. In theory, the hatchery offers the promise of using very small coastal streams as a water source, streams which provide insufficient water for spwaning channels. The prototype hatchery consists of wooden hatchery tanks with water upwelling across a bed of crushed rock at velocities ranging from 20 to 40 inches per hour. Fertilized eggs are placed on screened trays which overlie the crushed rock. Lids exclude light. Excess water overflows through drains to provide fry a pathway from the hatchery tanks. The fry leave voluntarily and swim about 150 feet through raceways to reach Netarts Bay. (Knapp-USGS)
W74-04797

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

TENTH YEAR ANNUAL REPORT, CENTER FOR RESEARCH IN WATER RESOURCES, UNIVERSITY OF TEXAS AT AUSTIN.
Texas Univ., Austin. Center for Research in Water Resources.
(CRWR News, Vol 9, No 4), September 1973. 27 p.

Descriptors: *Universities, *Texas, *Water Resources Research Act, Colleges, Grants, Contracts, Research and development, Laboratories, Research facilities, *Education, *Training, Optimum development plans, Systems analysis, Regional analysis.
Identifiers: University of Texas.

The Center for Research in Water Resources (CRWR) was established in the spring of 1963 to facilitate interdisciplinary programs of water resources research in engineering, in biological, physical and social sciences, and in law. CRWR seeks to fulfill these goals: to serve higher education, and other institutions, in the process by which skilled people will become available to serve using agencies; to provide a regional center of expertise and a repository of knowledge for use in research, education, practical projects, planning, and design; to serve public interests in the conservation, development, and use of water resources, particularly assisting planning and regulatory bodies at local, state, regional, and federal levels; and to make available to business and industry the services of advanced research. The main thrust of research for this fiscal year (1974) is analyzing and evaluating optimum management techniques of regional water systems, and environmental system analysis. (Knapp-USGS)
W74-04595

9D. Grants, Contracts, and Research Act Allotments

FEDERAL WATER RESOURCES RESEARCH PROGRAM FOR 1971.
National Science Foundation, Washington, D.C. Science and Technology Policy Office.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $1.70. Publication NSF 73-400, 1973. 134 p, 3 tab, 2 append.

Descriptors: *Water resources research act, *Research and development, Federal government, Conferences.
Identifiers: *Committee on Water Resources Research.

This report of the Committee on Water Resources Research of the Federal Council for Science and Technology is the Committee's periodic statement on the state of water resources research in the Federal Government. Each agency of government with a water resources research program is reported on individually. This report also presents the usual summaries of the total water resources research effort in the Government under the 10 categories developed previously by this Committee. (Knapp-USGS)
W74-04848

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

THERMAL CONDITIONS IN PERMAFROST--A REVIEW OF NORTH AMERICAN LITERATURE,
National Research Council of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 2C.
W74-04347

DISTRIBUTION OF PERMAFROST IN NORTH AMERICA AND ITS RELATIONSHIP TO THE ENVIRONMENT: A REVIEW, 1963-1973,
National Research Council of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 2C.
W74-04353

PHYSICS, CHEMISTRY, AND MECHANICS OF FROZEN GROUND: A REVIEW,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04373

MAPPING AND PREDICTING PERMAFROST IN NORTH AMERICA: A REVIEW, 1963-1973,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2C.
W74-04398

ENGINEERING DESIGN AND CONSTRUCTION IN PERMAFROST REGIONS: A REVIEW,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 8D.
W74-04404

WORLD DESERTIFICATION: CAUSE AND EFFECT. A LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 3B.
W74-04461

COMMUNITY WATER SUPPLY.
Agency for International Development, Washington, D.C. Office of the War on Hunger.
For primary bibliographic entry see Field 4B.
W74-04510

HOUSING AND PLANNING REFERENCES.
Department of Housing and Urban Development, Washington, D.C.
For primary bibliographic entry see Field 3D.
W74-04511

PLANT RESPONSES TO WATER STRESS,
California Univ., Davis. Lab. of Plant-Water Relations.
For primary bibliographic entry see Field 2I.
W74-04539

1972 REVIEW OF THE LITERATURE ON PULP AND PAPER EFFLUENT MANAGEMENT,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W74-04540

THE WATER BALANCE IN ARCTIC AND SUBARCTIC REGIONS--ANNOTATED BIBLIOGRAPHY AND PRELIMINARY ASSESSMENT,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04601

FIELD INVESTIGATION PRACTICES OF COASTAL STUDIES IN JAPAN,
Tokyo Univ. (Japan).
For primary bibliographic entry see Field 2L.
W74-04625

SELECTED BIBLIOGRAPHY ON BEACH FEATURES AND RELATED NEARSHORE PROCESSES.
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2J.
W74-04728

AN ANNOTATED BIBLIOGRAPHY OF FLUSHING AND DISPERSION IN TIDAL WATERS,
Navy Hydrographic Office, Washington, D. C.
For primary bibliographic entry see Field 2L.
W74-04731

10F. Preparation Of Reviews

THERMAL CONDITIONS IN PERMAFROST--A REVIEW OF NORTH AMERICAN LITERATURE,
National Research Council of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 2C.
W74-04347

DISTRIBUTION OF PERMAFROST IN NORTH AMERICA AND ITS RELATIONSHIP TO THE ENVIRONMENT: A REVIEW, 1963-1973,
National Research Council of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 2C.
W74-04353

ORIGIN, COMPOSITION, AND STRUCTURE OF PERENNIALLY FROZEN GROUND AND GROUND ICE: A REVIEW,
British Columbia Univ., Vancouver.
For primary bibliographic entry see Field 2C.
W74-04366

PHYSICS, CHEMISTRY, AND MECHANICS OF FROZEN GROUND: A REVIEW,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-04373

GROUNDWATER INVESTIGATIONS IN PERMAFROST REGIONS OF NORTH AMERICA: A REVIEW,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 02F.
W74-04391

MAPPING AND PREDICTING PERMAFROST IN NORTH AMERICA: A REVIEW, 1963-1973,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02C.
W74-04398

ENGINEERING DESIGN AND CONSTRUCTION IN PERMAFROST REGIONS: A REVIEW,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 08D.
W74-04404

SOUTHWESTERN GROUNDWATER LAW: A TEXTUAL AND BIBLIOGRAPHIC INTERPRETATION,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 04B.
W74-04460

WORLD DESERTIFICATION: CAUSE AND EFFECT. A LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 03B.
W74-04461

PLANT RESPONSES TO WATER STRESS,
California Univ., Davis. Lab. of Plant-Water Relations.
For primary bibliographic entry see Field 02I.
W74-04539

1972 REVIEW OF THE LITERATURE ON PULP AND PAPER EFFLUENT MANAGEMENT,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 05D.
W74-04540

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 7, NUMBER 10
MAY 15, 1974

W74-04851 -- W74-05400

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

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MAY 15, 1974

W74-04851 -- W74-05400

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

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06 WATER RESOURCES PLANNING
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07 RESOURCES DATA
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

CLUSTERING IN SUPERCOOLED WATER,
Cryobiology Research Inst., Madison, Wis.
D. H. Rasmussen, and A. P. MacKenzie.
Journal of Chemical Physics, Vol 59, No 9, p 5003-5013, Nov. 1, 1973. 10 fig, 1 tab, 29 ref.

Descriptors: *Supercooling, *Water properties, *Water structure, *Specific heat, *Density, *Heavy water, Theoretical analysis, Cooling, Temperature, Thermal capacity, Thermal properties, Molecular structure, Physical properties, Physicochemical properties, Deuterium.

The specific heats and densities of supercooled water and heavy water have been measured from the respective melting points to the respective homogeneous nucleation temperatures. The calorimetric measurements indicate structural contributions to the differences between the specific heats of the liquids and the corresponding crystals. These 'structural specific heats' are exponential functions of the supercooling. The results are interpreted in terms of Frenkel's heterophase fluctuation theory. It is concluded that, during supercooling, water molecules tend to form icelike clusters incorporating six or more monomers. (Brown-IPC)
W74-05251

2. WATER CYCLE

2A. General

WATER-RESOURCES APPRAISAL OF THE BIG SANDY AREA, MOHAVE COUNTY, ARIZONA,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 4B.
W74-04922

PRACTICAL SIMULATION MODELS OF THE SUBSURFACE HYDROLOGIC SYSTEM WITH EXAMPLE APPLICATIONS,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W74-04973

THE DEVELOPMENT AND FIELD TESTING OF A BASIN HYDROLOGY SIMULATOR,
Kansas Univ., Lawrence. Dept. of Chemical and Petroleum Engineering.
D. W. Green, E. C. Pogge, R. M. Knapp, B. Schorn, and C. Stanford.
Available from the National Technical Information Service as PB-229 501, $5.75 in paper copy, $1.45 in microfiche. University of Kansas Center for Research, Inc., Lawrence, Completion Report, August 1973. 193 p, 39 fig, 7 tab, 38 ref, 2 append. OWRR C-2039(No 3357) (1). 14-31-0001-3357.

Descriptors: *Computer models, *Groundwater basins, *Streamflow forecasting, *River basins, *Surface-groundwater relationships, Groundwater recharge, Groundwater, Base flow, Aquifers, Routing, Hydrologic budget, Soil water movement, Hydrologic cycle, Model studies, Water resources development, *Simulation analysis, *Kansas, Water management(Applied).
Identifiers: Numerical modeling, Stream-aquifer interaction, Stream basin, Surface-groundwater interactions, Basin evapotranspiration, *Little Arkansas River basin(Kan).

A digital computer model was developed to describe the hydrology of a stream basin and associated aquifer. The model simulates both surface-water and ground-water phases and their interaction. Input to the model includes precipitation, climatic conditions, boundary and initial conditions, and basin constants. Provision has been made for modeling withdrawals from both groundwater and surface waters for consumptive use. The computer output includes streamflow hydrographs at selected points, groundwater levels, and summaries of important moisture fluxes. The model was successfully tested by using it to simulate the hydrologic behavior of the Little Arkansas River basin in south-central Kansas. The model was used to simulate the 25 years from 1946 to 1970. The results of the simulation were evaluated by comparing the calculated daily discharges to actual streamflow data and the computed groundwater levels to observation well data at sixteen observation sites for the 25-year period. The groundwater heads at the end of 1970 were also compared to a pieziometric survey completed in the spring of 1971. The simulation results were considered quite good. Complex hydrologic features in the groundwater were maintained within the accuracy of the simulator and the time response of the groundwater heads in the observation wells closely followed the actual behavior of those wells. With the exception of extreme weather conditions, the computed basin discharges approximated the behavior of the actual basin.
W74-04984

COLLABORATION OF THE U.S.S.R. AND THE U.S.A. IN THE FIELD OF HYDRAULIC ENGINEERING AND LAND RECLAMATION,
For primary bibliographic entry see Field 6E.
W74-05076

PROBLEMS IN HYDROLOGIC FORECASTING (VOPROSY GIDROLOGICHESKIKH PROGNOZOV).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 4A.
W74-05141

COMPOSITIONAL MODELING OF HYDROGRAPHS (KOMPOZITSIONNOYE MODELIROVANIYE GIDROGRAFOV),
G. A. Grinevich, N. A. Petelina, and A. G. Grinevich.
Izdatel'stvo 'Nauka', Moscow, 1972. 183 p.

Descriptors: *Hydrographys, *Runoff, *Floods, *Model studies, *Statistical methods, Correlation analysis, Histograms, Probability, Stochastic processes, Markov processes, Variability, Fluctuations, Seasonal, Wet seasons, Dry seasons, Distribution patterns, Flood waves, Flood discharge, Curves, Equations.
Identifiers: USSR, Nomograms.

Processes in the grouping of wet and dry years on rivers are examined, and improved method of statistically describing and of modeling long-term and seasonal fluctuations of runoff are described. Possibilities are discussed for obtaining and considering additional information for more accurate estimation of the probability of development of different (including extremal) hydrologic situations on rivers, such as catastrophic floods, groups of dry and wet years, and runoff deficits. (Josefson-USGS)
W74-05146

2B. Precipitation

THE EFFECTS OF HURRICANE CAMILLE ON THE MARSHES OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
For primary bibliographic entry see Field 2L.
W74-04875

BOMEX RAINY DAY ANALYSIS,
National Oceanic and Atmospheric Administration, Washington, D.C. Center for Experiment Design and Data Analysis.
G. W. Elliott.
Technical Memorandum EDS BOMAP-10, July 1973. 9 p, 5 fig, 2 ref.

Descriptors: *Salinity, *Mixing, *Sea water, *Rainfall intensity, Data collections, Atlantic Ocean, Oceanography, *Precipitation intensity.

An investigation was made during the Barbados Oceanographic and Meteorological Experiment (BOMEX) in 1969 to evaluate the possibility of determining total precipitation from the change in salinity or temperature at the ocean surface. Salinity-temperature-depth (STD) soundings were taken at 3-hr intervals during periods of no rain, and at 5- to 6-min intervals during periods of rain. During periods of no rain, salinity regularly fluctuated by 0.015%. Fluctuations of this magnitude are likely to obscure possible salinity depressions due to rainfall. No rainfall-related long-term salinity depressions were evident. Many sharp, short-term depressions of salinity, on the order of 10 to 45 min, however, were observed during periods of rainfall. (Knapp-USGS)
W74-04921

THE ASH WEDNESDAY EAST COAST STORM, MARCH 5-8, 1962. A HINDCAST OF EVENTS, CAUSES, AND EFFECTS,
National Engineering Science Co., Washington, D. C.
For primary bibliographic entry see Field 2J.
W74-04969

HURRICANE STUDIES FOR NARRAGANSETT BAY,
Corps of Engineers, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 8B.
W74-04970

NUMERICAL PREDICTION ON TYPHOON TIDE IN TOKYO BAY,
Central Research Inst. of Electric Power Industry, Tokyo (Japan).
For primary bibliographic entry see Field 2L.
W74-04971

RAINFALL INTENSITIES IN ISRAEL,
Z. Schein, and N. Buras.
Israel Journal of Earth-Sciences, Vol 22, p 15-30, 1973. 3 fig, 5 tab, 10 ref.

Descriptors: *Depth-area-duration analysis, *Depth-area curves, *Rainfall, Arid lands, Distribution patterns, Probability, Frequency analysis, Hyetographs, Hydrologic data, Data collections, Climatic data, *Arid climates.
Identifiers: *Israel.

Rainfall-depth-duration-probability relations and regional rainfall distributions were developed for Israel from 17 recording gages with 14-33 years of records. Monthly probabilities for daily and shorter duration rainfall were estimated from five selected stations with long-term records. (Knapp-USGS)
W74-05123

LAKE MICHIGAN SNOW SQUALLS INCREASE ANNUAL PRECIPITATION IN THE UDELL HILLS,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
D. H. Urie.
Available from NTIS, Springfield, Va. 22151, PB-223 489, Price $2.75 printed copy; $1.45 microfiche. Forest Service Research Note NC-120, 1971. 4 p, 3 fig, 1 tab, 4 ref.

Descriptors: *Snowfall, *Precipitation(Atmospheric), *Orography, *Lake Michigan, Topography, Water balance.
Identifiers: *Udell Hills(Mich).

Snow squall concentration in the Udell Hills of Michigan illustrates the effects of minor topographic features and the proximity of Lake Michigan on the seasonal distribution of precipitation. Water budget studies in areas of similar topography can use the relationships developed in this study. (Knapp-USGS)
W74-05124

A THEORY OF MICROWAVE APPARENT TEMPERATURE OVER THE OCEAN,
Kansas Univ./Center for Research, Inc., Lawrence.
S. T. Wu, and A. K. Fung.
Available from NTIS, Springfield, Va. 22151, NASA CR-2329, Price $4.50 (domestic); $7.00 (foreign) $1.45 microfiche. National Aeronautics and Space Administration Contractor Report CR-2329, November 1973. 146 p, 35 fig, 11 tab, 127 ref, append. NASA Contract NAS 1-10048.

Descriptors: *Microwaves, *Water temperature, *Remote sensing, Waves(Water), Meteorological data, Data collections, Weather data, Winds, Oceans.
Identifiers: *Microwave radiometry.

In the microwave region combined active (scatterometer) and passive (radiometer) remote sensors over the ocean show promise of providing surface wind speeds and weather information. Several approaches to the problem are now available, but none satisfactorily predict both the scattering and emission characteristics of the sea surface. The disagreement may be accounted for at least in part by the use of an improper surface model. A composite surface scattering theory is investigated as a more realistic approach. A two-scale scattering theory was extended to compute the emission and scattering characteristics of ocean surfaces. The effect of the small irregularities upon the scattering characteristics of the large undulations is included by modifying the Fresnel reflection coefficients; the effect of the large undulations upon those of the small irregularities is accounted for by averaging the scattering cross sections of the small irregularities over the surface normals of the large undulations. The wind dependent parameters of the theory are established by comparing the emission characteristic with measurement and by using measured sea slope data. Improved agreement with measured scattering and emission results over a single-surface theory is demonstrated by the composite theory. The effects of clouds and rain on the radiometer and scatterometer observations were also investigated using horizontally stratified model atmospheres with rough sea surfaces underneath. For heavy rainfall rates the effects of scattering on the radiative transfer process are included. Clouds and rains cause the radiometer to lose contact with the surface when clouds or rain intervene. However, the rise of apparent temperature can be used to compute the atmospheric attenuation and the scatterometer measurement can be corrected accordingly. (Knapp-USGS)
W74-05126

CHEMICAL COMPOSITION OF MONSOON RAINWATER OVER CHANDIGARH IN 1971,
Central Groundwater Board, Faridabad(India).
B. K. Handa.
Indian Geohydrology, Vol 9, No 1, p 31-37, June 1973. 2 tab, 23 ref.

Descriptors: *Water chemistry, *Rainfall, *Chemistry of precipitation, Water quality, Provenance.
Identifiers: *India(Chandigarh).

In rainwater over Chandigarh, India, bicarbonate ions and calcium ions are pre-eminent, so that the rainwater is primarily of the CaHCO3 type. The concentration of potassium ions is quite low but sometimes exceeds that of sodium ions. The weight ratio SO4/Cl also in some cases exceeds unity. Although the chloride ions are supposed to be mainly of marine origin, a comparison of the chemical analysis data of seawater with that of rainwater over Chandigarh shows that there is little resemblance between the two. However, the river water generally shows a great similarity to rainwater in the relative proportions of the various ions. The chemical composition of the rainwater varies quite irregularly. (Knapp-USGS)
W74-05130

EFFECT OF HYDROMETEOROLOGICAL CONDITIONS ON TIME OF ICE FORMATION ON RIVERS IN THE BALTIC SEA REGION AND BELORUSSIA (VLIYANIYE GIDROMETEOROLOGICHESKIKH USLOVITY NA SROKI POYAVLENIYA L'DA NA REKAKH PRIBALTIKI I BELORUSSII),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2C.
W74-05143

20-24 YEAR CYCLE IN THE MARCH OF ATMOSPHERIC PRECIPITATION AND ITS RELATION TO AIR CIRCULATION PATTERNS (TSIKL 20-24 GODA V KHODE ATMOSFERNYKH OSADKOV I YEGO SVYZA' S OSOBENNOSTYAMI ATMOSFERNOY TSIRKULYATSII),
Leningrad State Univ. (USSR)
L. A. Kudryavtseva.
Vestnik Leningradskogo Universiteta, No 6, Seriya Geologiya-Geografiya, No 1, p 87-93, March 1973. 1 fig, 5 ref.

Descriptors: *Precipitation(Atmospheric), *Air circulation, *Cycles, *Meteorology, Cyclones, Anticyclones, Correlation analysis, Forecasting, Curves.
Identifiers: *USSR.

Results are presented of a study of a 20-24 year cycle of precipitation over the USSR and of its relation to air circulation patterns. A 20-24 year cycle in the march of precipitation is manifested over a relatively large expanse of the USSR during warm and cold periods of the year and determines the general moisture background of these areas. The appearance of a 20-21 year cycle in the march of precipitation during the warm period over central regions of the Urals and West Siberia is due to regeneration processes and is expressed by the number of days with precipitation greater than or equal to 10.0 mm in a 24-hour period. The 20-24 year cycle can be used to prepare a long-term precipitation forecast. (Josefson-USGS)
W74-05149

ANNOTATED BIBLIOGRAPHY ON PRECIPITATION MEASUREMENT INSTRUMENTS,
World Meteorological Organization, Geneva (Switzerland).
J. C. Rodda.
Report No 17, A WMO contribution to the International Hydrological Decade (IHD), 1973. 278 p.

Descriptors: *Rain gages, *Instrumentation, *Precipitation gages, *Bibliographies, Abstracts, Measurement.

Precipitation measurement is the subject of this bibliography. Few, if any, entirely new instruments and techniques are featured in this report. Perhaps the most novel are the optical devices that look at the falling drops and flakes, but there is far greater emphasis on the development of existing methods. The measurement of snow is a problem that still remains to be solved, and this also applie to the other less common forms of precipitation. A large number of studies have been conducted to in vestigate the sources of error in precipitation mea surement, the majority being concerned with thos affecting the assessment of rain. (Knapp-USGS)
W74-05169

STORM OF MAY 5-6, 1973, IN THE DENVEI METRO AREA: FREQUENCY AND EFFECT,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W74-05171

2C. Snow, Ice, and Frost

THE EFFECT OF IMPURITIES ON THI MECHANICAL PROPERTIES OF ICE SINGLI CRYSTALS,
Department of the Environment, Ottaw (Ontario). Inland Waters Directorate.
T. Nakamura, and S. J. Jones.
Scientific Series No 24, 1973. 29 p, 45 fig, 3 tab, 3 ref.

Descriptors: *Ice, *Cryology, *Mechanical properties, *Stress strain, Crystallography, Aqueou solutions, *Tensile stress, Tensile strength, Ions.

Constant strain-rate tensile tests were carried ou on single crystals of ice doped with various impuri ties including HF, HCl, HBr, NH4F, NaF, KF NaOH, H2O2, NH4OH, and He. The tests were carried out in the temperature range of -5 deg C t -53 deg C. HF-doped crystals showed a softenin effect in this temperature range as well as in the lower temperature range previously reported HCl-doped crystals showed a less pronounced sof tening effect than HF. H2O2-doped crystal showed a softening effect at -26 deg C, one He doped crystal showed a hardening effect at -15 deg C, and the other impurities had no apparent effect An activation energy for pure ice of 18 plus o minus 2 kcal/mole was deduced; for HCl-dopec ice an activation energy of 12 plus or minus kcal/mole and 13 plus or minus 2 kcal/mole wa found using two methods of analysis. A power law relationship between stress and strain-rate wa found to hold for pure and HCl-doped crystals with n = 1.73 plus or minus 0.07. The distribution of fluorine and chlorine ions in the crystals showed marked increases in ion concentration towards the surface. (Knapp-USGS)
W74-04914

A STOCHASTIC SNOW MODEL TO EVALUATE RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 4A.
W74-04918

PHYTOMASS RESERVES IN SOME TYPES OF TUNDRA FROM THE NORTHERN OB RIVER RELATED AREA, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
For primary bibliographic entry see Field 2I.
W74-04940

EFFECT OF DIBBLING OF WINTER FALLOW ON HYDROPHYSICAL PROPERTIES OF FROZEN SOIL AND ON EROSION PROCESSES (VLIYANIYE LUNKOVANIYA ZYABI NA VODNO-FIZICHESKIYE SVOYSTVA MERZLOY POCHVY I PROTSESSY EROZII),
For primary bibliographic entry see Field 2G.
W74-05019

NORTH SLOPE - CONSTRUCTION CRITERIA FOR ROADS AND FACILITIES,
Atlantic Richfield Co., Dallas, Tex.

For primary bibliographic entry see Field 4A.
W74-05104

LAKE MICHIGAN SNOW SQUALLS INCREASE ANNUAL PRECIPITATION IN THE UDELL HILLS,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
For primary bibliographic entry see Field 2B.
W74-05124

LONG-RANGE FORECAST OF DURATION OF ICE PHENOMENA ON THE DANUBE RIVER (DOLGOSROCHNYY PROGNOZ PRODOLZHITEL'NOSTI LEDOVYKH YAVLENIY NA R. DUNAYE),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
T. N. ,Makarevich, Z. A. Yefimova, and L. K. Savina.
In: Voprosy gidrologicheskikh prognozov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, p 3-24, Leningrad, 1972. 7 fig, 4 tab, 45 ref, append.

Descriptors: *Ice, *Ice cover, *Forecasting, *Meteorology, Atmosphere, Air temperature, Atmospheric pressure, Air circulation, Synoptic analysis, Seasonal, Probability, Histograms, Curves.
Identifiers: *USSR(Danube River).

Problems relating to forecasts of the degree of severity of winters and of the duration of ice phenomena on the Danube River were investigated. Studies were made of the recurrence and probability of duration of ice phenomena for 4 unregulated reaches of the Danube from Bratislava to the river mouth between 1900 and 1968. The duration of ice phenomena on the Danube is closely related to air temperature in winter in Central Europe. Long-range forecast procedures were based on data on changes in the pressure field over Canada (1949-67) using the index of zonal circulation and on ground pressure data using the coefficient of expansion of pressure fields into natural components (1938-67). Forecast procedures based on use of the index of zonal circulation are preferred, and solutions obtained for the Lower Danube are more accurate than those for the Middle Danube because of the regime characteristics of the river's lower reaches and the greater continentality of the part of the basin. (See also W74-05141) (Josefson-USGS)
W74-05142

EFFECT OF HYDROMETEOROLOGICAL CONDITIONS ON TIME OF ICE FORMATION ON RIVERS IN THE BALTIC SEA REGION AND BELORUSSIA (VLIYANIYE GIDROMETEOROLOGICHESKIKH USLOVITY NA SROKI POYAVLENIYA L'DA NA REKAKH PRIBALTIKI I BELORUSSII),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
R. Ya. Alekseyenko.
In: Voprosy gidrologicheskikh prognozov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, p 57-67, Leningrad, 1972. 3 fig, 4 tab, 8 ref.

Descriptors: *Ice, *Ice cover, *Rivers, *Meteorology, Atmosphere, Air circulation, Air temperature, Discharge(Water), Water temperature, Heat balance, Heat transfer, Seasonal, Correlation analysis, Forecasting, Equations.
Identifiers: *Baltic Sea Region, *USSR(Belorussia), Heat exchange.

The influence of major items in the hydrologic and meteorological regimes affecting the date at which ice starts to form on rivers in the Baltic Sea Region and Belorussia was investigated for development of improved long-term ice-growth forecasts. Studies were made of the relation of dates of ice formation to air temperature, stream discharge, water temperature, heat discharge, and total heat exchange between water and the atmosphere. Average monthly air temperature was used for 1901-50 for eastern regions (Velizh, Vitebsk, Daugavpils) and for 1903-50 for western regions (Vilnius, Yelgava), and average 10-day air temperature was used for 1937-67 (for Velizh and Vitebsk) and for 1946-67 (for Daugavpils and Grodno). To determine dates of ice formation, heat transfer from the water surface to air and air circulation processes must be considered. (See also W74-05141) (Josefson-USGS)
W74-05143

FORECASTING THE MAXIMUM LEVEL OF ICE JAMS ON THE SEVERNAYA DVINA RIVER AT ARKHANGEL'SK (PROGNOZ MAKSIMAL'NOGO ZATORNOGO UROVNYA VODY R. SEVERNOY DVINY U G. ARKHANGEL'SKA),
Godsudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
R. A. Nezhikhovskiy, and N. P. Sakovskaya.
In: Voprosy gidrologicheskikh prognozov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, p 68-83, Leningrad, 1972. 5 fig, 4 tab, 8 ref.

Descriptors: *Ice, *Ice cover, *Ice jams, *Forecasting, Ice breakup, Discharge(Water), Inflow, Floods, Flood waves, Water levels, Profiles, Correlation analysis, Curves, Equations.
Identifiers: The maximum level of ice jams in the estuarine region of the Severnaya Dvina River, especially near Arkhangel'sk, is determined primarily by the rate of water discharge during the period of ice breakup on the river. A close empirical relation is established between the maximum level of ice jams and both the water discharge of the river at Abramkovo village and lateral inflow in the Abramkovo-Arkhangel'sk reach on the same day. The forecast is timed to coincide with the last day of thick, continuous ice cover at Abramkovo and can be made, on the average, 5-7 days in advance. (See also W74-05141) (Josefson-USGS)
W74-05144

THEORY OF METAMORPHISM OF WET SNOW,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. C. Colbeck.
Research Report 313, December 1973. 11 p, 7 fig, 13 ref.

Descriptors: *Snow, *Crystal growth, *Cryology, Avalanches, Melting, Freezing, Snowmelt, Permeability, Porosity, Temperature.
Identifiers: *Snow metamorphism.

Metamorphism by grain growth, bond growth, and densification of wet snow are described in terms of the distribution of equilibrium temperature in the snow matrix. At high water saturations the equilibrium temperature increases with grain size; hence, small particles melt away as large particles grow. Melting also occurs at the intergrain bonds, causing a low strength and rapid densification. At low saturations the equilibrium temperature is determined by the capillary pressure and the particle sizes have only a second order effect. Therefore, grain growth proceeds slowly and, even at large overburden pressures, no intergrain melting occurs. At low saturations the water tension acts through a finite area, thus large attractive forces exist between the grains, and the strength of the snow matrix is large. The behavior of wet snow governs the release of wet-snow avalanches and water runoff through seasonal snowpacks. The performance of oversnow vehicles and construction on snow covers are matters of practical necessity involving wet snow as a material. (Knapp-USGS)
W74-05154

THE AIDJEX LEAD EXPERIMENT,
Oregon State Univ., Corvallis. Dept. of Oceanography.
C. A. Paulson, and J. D. Smith.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 1-8, January 1974. 1 fig, 5 ref.

Descriptors: *Sea ice, *Movement, Currents(Water), Winds, Navigation, Heat transfer, Freezing, Convection, Heat flow, *Alaska.
Identifiers: Leads(Icepacks).

To study sea-ice movement, an open-lead experiment is planned. Atmospheric and oceanic observations are made at a newly created lead offshore from Barrow, Alaska. The atmospheric observations attempt to measure the vertical flux of heat and determine its relation to air-sea temperature difference, fetch, height, and wind speed. The oceanic observations seek to determine the characteristics of the density-driven convection in the vicinity of a lead by measuring the oceanic velocity and density fields. (Knapp-USGS)
W74-05158

SUBSURFACE EDDIES IN THE ARCTIC OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
K. L. Hunkins.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 9-36, January 1974. 17 fig, 1 tab, 11 ref. ONR Contract N00014-67-A-0108-0016.

Descriptors: *Eddies, *Arctic Ocean, *Ocean currents, Currents(Water), Mixing, Salinity, Density stratification, Turbulence, Vortices.

Transient undercurrents associated with eddies in the Arctic Ocean were observed at depths between 50 and 300 m. The velocity profile was parabolic with a maximum of 40 cm/sec at 150 m. A distortion of the salinity and temperature field accompanied these currents, and gradient equilibrium was closely approached in each case. The eddies persisted for several days. They were 10 to 20 km in diameter and were separated by 20-50 km. The eddies have their origin in the instability of the basic baroclinic current. A large-scale horizontal salinity gradient is produced by global conditions of oceanic precipitation-evaporation and modified by wind conditions. The currents accompanying such a density gradient are not stable but rather lead to growing disturbances. As the disturbances amplify, the potential energy of the horizontal density gradient is converted into the kinetic energy of eddies. (Knapp-USGS)
W74-05159

A RELATION BETWEEN THE POTENTIAL ENERGY PRODUCED BY RIDGING AND THE MECHANICAL WORK REQUIRED TO DEFORM PACK ICE,
Washington Univ., Seattle. Div. of Marine Resources.
D. A. Rothrock.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 45-51, January 1974. 5 ref.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties.
Identifiers: Ice mechanics.

The rate of production of potential energy by mechanical processes that change the thickness distribution of sea ice provides a useful lower bound for the rate of work by the two-dimensional stress in pack ice. A formal relation is derived between the plastic work and the increase of potential energy due to all ridging processes represented by the redistribution function. Since

the redistribution function can depend in general on twotdimensional strain rates, the extension to the two-dimensional case is included without further derivation. (Knapp-USGS)
W74-05160

REDISTRIBUTION FUNCTIONS AND THEIR YIELD SURFACES IN A PLASTIC THEORY OF PACK ICE DEFORMATION,
Washington Univ., Seattle. Div. of Marine Resources.
D. A. Rothrock.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 53-81, January 1974. 22 fig, 9 ref.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties.
Identifiers: *Ice mechanics.

A large-scale area of pack ice contains ice from zero to many meters thick. As the pack ice deforms, thin ice is ridged into thicker ice, in a way that depends on the strain rate and the instantaneous thickness distribution. The rate of this process is assumed to be proportional to the rate of deformation, and fixed proportions (by area) of the thinner ice are assumed to be ridged into ice of known thicknesses. The amount of this ridging is assumed to depend on the angle whose tangent is the ratio of the shearing rate to the divergence rate. The potential energy required to perform this ridging is equated to the plastic work performed by the horizontal ice stress. The ice is assumed to behave plastically. For stresses inside a yield surface, the ice is rigid. Stresses on the yield surface cause the ice to flow by the rule that the strain rate tensor is normal to the yield surface in stress space. The size of the yield surface depends on the thickness distribution. (Knapp-USGS)
W74-05161

DIMENSIONLESS STRENGTH PARAMETERS FOR FLOATING ICE SHEETS,
Washington Univ., Seattle. Dept. of Aeronautics and Astronautics.
R. R. Parmerter.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 83-95, January 1974. 5 fig, 8 ref. NSF Grant GV-28807.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties.
Identifiers: *Ice mechanics.

The equations governing a floating ice sheet subjected to vertical loading were studied in dimensionless form. In thin sheets, the ratio of transverse shear to bending stress is proportional to the fourth root of thickness, so that bending stress dominates. Thus, simple plate theory, which ignores the deformation due to shear, may be used for ice sheets up to several meters thick. The bending stress in the sheet may be incorporated into a dimensionless strength parameter that depends on the functional form of the loading and Poisson's ratio. Where the loading is one dimensional, the strength parameter depends only on the form of the loading. The more complex problem in which in-plane forces interact through the vertical deformations to create additional loading was also studied. This class of problems includes problems of elastic buckling. The problem of the rafting of ice, in which one sheet overrides another without breaking, is an example. The stress parameter is calculated as a function of the geometry of the rafting sheet. If the actual strength of the ice is such that the strength parameter falls below the solution curve, the ice will break before it rafts. The maximum thickness of ice that can raft without breaking depends on the square of the ice thickness. The calculation of 17 cm for typical young sea ice agrees well with field observations, although older ice, because of its greater strength, can raft when it is several meters thick. (Knapp-USGS)
W74-05162

A MECHANICAL MODEL OF RAFTING,
Washington Univ., Seattle. Dept. of Aeronautics and Astronautics.
R. R. Parmerter.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 97-115, January 1974. 6 fig, 8 ref, append. NSF Grant GV-28807.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties.
Identifiers: *Rafting(Sea ice).

The simple rafting of two ice sheets of equal thickness is investigated. The force required to initiate rafting is small compared to the force required to buckle the ice sheet. Maximum stresses occur in the submerged portion of the overridden sheet. As the thickness of the sheets is increased, the maximum stress developed during rafting increases. Thus, there exists a critical ice thickness at which rafting causes the overridden sheet to fail. Ice thicker than this critical value will fail and therefore cannot raft. The ice blocks that are broken from the sheet during failture of rafting provide rubble, which then produces a ridge structure. Thus, thick ice tends to deform through ridging and thin ice tends to raft. (Knapp-USGS)
W74-05163

ON THE CALCULATION OF THE ROUGHNESS PARAMETER OF SEA ICE,
Washington Univ., Seattle. Div. of Marine Resources.
C-H. Ling, and N. Untersteiner.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 117-125, January 1974. 4 fig, 1 tab, 14 ref. NSF Grant GV-28807, NSF Grant C-625.

Descriptors: *Sea ice, *Air-water interfaces, *Roughness coefficient, Boundary processes, Winds, Movement, Friction, Turbulent flow, Topography.
Identifiers: *Roughness(Mechanical), Ice dynamics.

A method is described for calculating the roughness parameter of sea ice from velocity profiles. Instead of the conventional procedure of determining an individual roughness for each velocity profile, this method uses a number of profiles to find a single value. By means of a set of data obtained in the Arctic, it is shown that the method greatly reduces the scatter in roughness and produces consistent values for the friction velocity. (Knapp-USGS)
W74-05164

CLASSIFICATION AND VARIATION OF SEA ICE RIDGING IN THE ARCTIC BASIN,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. D. Hibler, III, S. J. Mock, and W. B. Tucker, III.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 127-146, January 1974. 5 fig, 6 tab, 16 ref, append.

Descriptors: *Sea ice, *Deformation, *Plastic deformation, Movement, Equations, Yield strength, Poisson ratio, Failure(Mechanics), Buckling, Mechanical properties, *Arctic.
Identifiers: *Ridging(Sea ice).

A one-parameter model for pressure ridges agrees well with more than 3000 km of laser profile data taken from November 1970 to February 1973 in the Arctic basin. Ridging intensity may be determined for a region from the mean number of ridges per unit length and the mean ridge height. Using ridging intensity the number of ridges per kilometer at any ridge height level may be predicted. Although magnitudes of ridging intensity vary in time, the relative regional variations are similar. Consequently, three distinct regions of ridging intensity having relatively stable boundaries can be defined. Annual variation in new ice production due to ridging is sufficiently large to suggest that ridging plays an important role in the overall mass balance of the Arctic basin. (Knapp-USGS)
W74-05165

SIMILARITY CONSTANTS IN THE STRATIFIED PLANETARY BOUNDARY LAYER,
Washington Univ., Seattle. Div. of Marine Resources.
For primary bibliographic entry see Field 2E.
W74-05166

AN INVESTIGATION OF CORE DRILLING IN PERENNIALLY FROZEN GRAVELS AND ROCK,
Cold Regions Research and Engineering Lab., Hanover, N.H.
G. R. Lange.
Technical Report 245, December 1973. 26 p, 5 fig, 2 tab, 8 ref, 2 append.

Descriptors: *Core drilling, *Permafrost, *Frozen ground, Boreholes, Cores, Drilling fluids, Drilling, Rotary drilling, Sampling, Drilling equipment, Drilling samples.

The problems of obtaining frozen samples by core drilling of perennially frozen gravel and rock were investigated. Most of the core drilling was carried out in ice-bonded, well-graded alluvial gravel with the ground temperature near its freezing point. Both chilled compressed air and oil-based liquids were used as drilling fluids. The details of both successful and unsuccessful coring attempts are reported. Drilling variables such as weight on the bit, rotational velocity, rate of penetration, fluid temperatures, viscosities, flow rates and pressures and mechanical details of the diamond bits are reported. To make the information more widely applicable, calculated values for the pressure on the bit, the lineal velocity range of the diamond points, the force per diamond point, and the uphole velocity of the fluid stream are given. Some core drilling was also successfully accomplished in frozen, fractured rock. With careful control of the drilling variables, good samples of these difficult materials can be obtained at satisfactory drilling rates so long as the material is well bonded by ice. Suggestions are given for improvement of equipment and methods. (Knapp-USGS)
W74-05170

2D. Evaporation and Transpiration

PAN AND LAKE EVAPORATION IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
J. J. Rahn.
Available from NTIS, Springfield, Va. 22151, COM-73-11435, Price $3.50 printed copy; $1.45 microfiche. Information Report No 69, May 1973. 23 p, 6 fig, 3 tab, 10 ref.

Descriptors: *Evaporation, *Pennsylvania, *Data collections, Hydrologic cycle, *Evaporation pans, Evaporimeters, Reservoir evaporation, Lakes.
Identifiers: Lake evaporation.

All available sources of pan evaporation data in Pennsylvania are compiled to provide an updated and more detailed analysis than was possible with national maps. Class A pan evaporation is com-

pared to evaporation from lakes and other water bodies. Mean annual pan evaporation ranges from about 48 inches in the lower Susquehanna River region to slightly less than 32 inches in the north-central section of the State. Mean annual lake evaporation follows the same general pattern, from about 36 to less than 24 inches. Mean monthly and seasonal values, 90% probability limits, and observed extremes are summarized for six stations with long-term records. Highest mean monthly pan evaporation occurs in July, ranging from about 5.5 to 7.5 inches. Daily extremes in evaporation losses from pans are estimated to range between zero and 0.6 inch. (Knapp-USGS)
W74-05121

COMPARISON BETWEEN PAN AND LAKE EVAPORATION,
C. E. Hounam.
World Meteorological Organization Technical Note No 126, 1973. 52 p, 7 fig, 12 tab, 27 ref.

Descriptors: Evaporation, *Evaporimeters, Calibrations, *Evaporation pans, Reservoir evaporation, Lakes.
Identifiers: *Lake evaporation.

The simplest and most common means of estimating lake evaporation is on the basis of data obtained from pan and tank evaporimeters. The most important types of evaporimeter that are in use are described, with details of their construction and advice on their use. The factors having an influence on pan and lake evaporation are discussed in relation to the various coefficients that have been developed for converting the evaporation rates from pans and tanks to estimates of lake evaporation. These coefficients vary significantly in space, in time, and in relation to the particular characteristics of the lake in question. A description is given of the methods proposed for correcting them so as to eliminate the effects of such variations. (Knapp-USGS)
W74-05155

TRANSPIRATION MEASUREMENT IN PINES USING TRITIATED WATER AS A TRACER,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 5B.
W74-05197

TRANSPIRATION OF THE MAIN TREE SPECIES ON THE BOL'-SHOI USHKANII ISLAND (THE BAIKAL LAKE) IN DIFFERENT SEASONS (IN RUSSIAN),
V. N. Pautova.
Lesovedenie. 6. p 59-62, 1970, English summary.
Identifiers: Islands, Lakes, Pines, Seasons, *Transpiration, *Tree species, *USSR(Lake Baikal).

The characteristics and the order of variation of the transpiration intensity of some tree species are established in their transition from the state of dormancy to that of growth and in the course of the latter. The maximum possible water expenditure by pine needles for 5 winter months in the stands of the Bol'shoi Ushkanii Island is 0.15-0.30 mm. The connection is shown between the transpiration and the age of the plant, shoot, and needles as well as its connection with the tree species.--Copyright 1973, Biological Abstracts, Inc.
W74-05364

2E. Streamflow and Runoff

DEVELOPMENT OF A METER FOR MEASUREMENT OF SEWER FLOW,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-04857

LONGSHORE CURRENTS GENERATED BY OBLIQUELY INCIDENT SEA WAVES,
Oregon State Univ., Corvallis.
M. S. Longuet-Higgins.
Journal of Geophysical Research, Vol 75, No 33, p 6778-6789, November 20, 1970. 4 fig, 5 tab, 32 ref.

Descriptors: *Waves(Water), *Mixing, *Turbulence, Coasts, Beaches.
Identifiers: *Longshore current, Radiation stress, *Wave energy, *Bottom friction, *Surf zone, Nearshore processes.

There exists a simple and precise relationship between the total longshore thrust exerted by the incoming waves on the one hand and their direction and amplitude in deep water on the other. This can be derived either from the concept of the radiation stress, or by a direct evaluation of the momentum flux due to the waves. The local longshore stress due to the waves is very simply related to the local rate of dissipation of wave energy, regardless of whether the dissipation is due to wave breaking or to bottom friction. Hence, using the known relation of breaker height to local depth in the surf zone, one can estimate accurately the local longshore stress due to the waves. When the local longshore wave stress is known, it is possible to write an equation of motion for the longshore current that involves in general both the bottom friction and the horizontal mixing by turbulent eddies. If the horizontal mixing is negligible, the momentum balance gives an exceedingly simple expression for the longshore current. The addition of horizontal mixing generally reduces the current, although not drastically. (Sinha-OEIS)
W74-04943

THE INTERNAL VELOCITY FIELD IN BREAKING WAVES,
Chicago Univ., Ill. Dept. of Geophysical Sciences.
For primary bibliographic entry see Field 2J.
W74-04960

WAVE ENERGY AND LITTORAL TRANSPORT,
Laboratorio Nacional de Engenharia Civil, Lisbon (Portugal).
For primary bibliographic entry see Field 2J.
W74-04965

QUANTITATIVE RESEARCH ON LITTORAL DRIFT IN FIELD AND LABORATORY,
Florida Univ., Gainesville. Coastal Engineering Lab.
For primary bibliographic entry see Field 2J.
W74-04966

FLOOD PLAIN INFORMATION: BIG BUFFALO CREEK-LITTLE BUFFALO CREEK--CITY OF SANFORD, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-04993

FLOOD STAGES AND DISCHARGES FOR SMALL STREAMS IN TEXAS,
Geological Survey, Austin, Tex.
E. E. Schroeder.
Open-file report, 1973. 297 p, 1 fig, 3 tab, 10 ref.

Descriptors: *Data collections, *Flood data, *Texas, Small watersheds, *Hydrologic data, Flood forecasting, Peak discharge.

Basic hydrologic data are compiled to be used to define the magnitude and frequency of floods for drainage areas of less than 20 square miles in Texas. To accomplish the objective, a network of 150 crest-stage partial-record gages was established. These gages are distributed throughout the State to sample all hydrologic areas and flood-frequency regions as defined by Patterson (1963) and to obtain a representative sample of physical characteristics. Information for unusual peak discharges at ungaged sites is obtained as the opportunity arises. Each gage site is equipped with one or more crest-stage gages and a stage-rainfall recorder. A typical installation consists of two crest-stage gages--one headwater gage and one tailwater gage. Data are being collected at 82 other small-stream stations for other projects, making a total of 232 stations available for this study. During the 1971 water year, annual runoff was deficient in the north, east, and central parts of the State, below average in the west, and average in the south. Runoff at individual sites varied greatly. Several streamflow stations in the southern Edwards Plateau area recorded new peak discharges for the period of record. This occurred during the period Aug. 11-14. No widespread major flooding occurred during the year. Numerous flash floods covering relatively small areas did occur. Tropical disturbances caused heavy rainfall in some coastal areas. (Knapp-USGS)
W74-05107

NUMERICAL MARCHING TECHNIQUES FOR FLUID FLOWS WITH HEAT TRANSFER,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 8B.
W74-05128

LARGE RIVERS OF THE UNITED STATES.,
Geological Survey, Reston, Va.
K. T. Iseri, and W. B. Langbein.
Circular 686, 1974. 10 p, 4 fig, 2 tab.

Descriptors: *Rivers, *United States, Distance, *Streamflow, Hydrologic data, Data collections, *Discharge(Water).
Identifiers: *Large rivers(U.S.).

Information on the flow of the 28 largest rivers in the United States is presented for the base periods 1931-60 and 1941-70. Drainage area, stream length, source, and mouth are included. Average discharge is listed at downstream gaging stations. Large rivers are listed in order of average discharge at the mouth, based on the period 1941-70. (Knapp-USGS)
W74-05138

ON THE POSITION OF TIDAL BARRIERS IN NORTHUMBERLAND STRAIT,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
K. B. Yuen.
Manuscript Report Series, No 33, 1973. 26 p, 11 fig, 6 ref.

Descriptors: *Numerical analysis, *Tides, *Water level fluctuations, Mathematical models, Inlets(Waterways), Water levels, Currents(Water), Seiches, *Canada.
Identifiers: *Causeways.

A one-dimensional mathematical tidal model was constructed which reproduces satisfactorily the normal M2, S2, K1, and O1 tidal constituents in Northumberland Strait, Canada. Calculations for the construction of complete tidal barriers at a range of locations indicated that the vicinity of the Cape Tormentine area is very critical for the semidiurnal constituents, especially for the resulting tide on the eastern side of a causeway. The worst case resulted in an M2 head difference of order 9.0 feet from one side of the causeway to the other, yet a shift of less than 12.0 miles could reduce this to only 5.0 feet. In contrast, the diurnal constituents were relatively insensitive to the exact causeway location. For the Cape Tormentine area, the M2 configuration was also examined for the case of partial barriers. Even for 90% closure, the head difference across the causeway was only 1.0 foot. However, the currents increased with greater closure, but even for 80% closure, the M2 current was only 6.0 feet/sec. (Knapp-USGS)
W74-05140

FORECASTING MAXIMUM FLOOD LEVELS ON THE DNIESTER RIVER (PROGNOZ MAKSIMAL'NYKH PAVODOCHNYKH UROVENY VODY R. DNESTRA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 4A.
W74-05145

COMPOSITIONAL MODELING OF HYDROGRAPHS (KOMPOZITSIONNOYE MODELIROVANIYE GIDROGRAFOV),
For primary bibliographic entry see Field 2A.
W74-05146

SEASONAL VARIABILITY OF WATER TEMPERATURE IN THE VICINITY OF THE JAPAN CURRENT (VNUTRISEZONNAYA IZMENCHIVOST' TEMPERATURY VODY V RAYONE KUROSIO),
Leningrad State Univ. (USSR).
P. K. Guber, and V. V. Klepikov.
Vestnik Leningradskogo Universiteta, No 6, Seriya Geologiya-Geografiya, No 1, p 104-111, March 1973. 2 fig, 2 tab, 12 ref.

Descriptors: *Oceanography, *Water temperature, *Varibility, *Fluctuations, *Seasonal, Thermocline, Heat, Heat balance, Advection, Wind velocity, Currents(Water), Internal waves, Statistical methods, Correlation analysis, Spectroscopy, Curves, Equations, *Pacific Ocean.
Identifiers: USSR, *Japan current(Kuroshio), Ocean weather stations.

Variations in oceanographic conditions were investigated in the region of ocean weather stations 'Extra' ('X') and 'Tango' ('T') in the North Pacific Ocean between July 1951 and November 1953. Intensity and frequency of seasonal fluctuations with time scales ranging from 2-3 days to 3-4 months were determined in the 0- to 1,000-m layer by statistical analysis of water temperature. Seasonal fluctuations of water temperature in the region depend little on fluctuations in the heat balance of the sea surface but are caused mainly by fluctuations in the advection of heat by currents and internal waves. (Josefson-USGS)
W74-05150

THE AIDJEX LEAD EXPERIMENT,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 2C.
W74-05158

SUBSURFACE EDDIES IN THE ARCTIC OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 2C.
W74-05159

SIMILARITY CONSTANTS IN THE STRATIFIED PLANETARY BOUNDARY LAYER,
Washington Univ., Seattle. Div. of Marine Resources.
R. A. Brown.
AIDJEX Bulletin No 23, Washington University Division of Marine Resources, p 147-155, January 1974. 1 fig, 19 ref.

Descriptors: *Air-water interfaces, *Winds, *Currents(Water), *Boundary layers, Boundary processes, Ocean currents, Ice, Sea ice.

The classical solutions for the relationship between geostrophic, Ekman layer, and surface layer flow were developed into a continuous solution for the semi-infinite flow over a surface. This solution leads to a two-layer composite boundary layer solution with matching criteria. The matching process indicates a correspondence between the stress and the geostrophic flow deviation involving two arbitrary parameters. Some values of these similarity constants determined from data for neutral and stratified boundary layers are discussed. (Knapp-USGS)
W74-05166

STORM OF MAY 5-6, 1973, IN THE DENVER METRO AREA: FREQUENCY AND EFFECT,
Geological Survey, Denver, Colo.
G. L. Ducret, Jr., and W. R. Hansen.
Urban Drainage and Flood Control District, Denver, 1973. 40 p, 6 fig, 5 tab, 2 ref, 2 append.

Descriptors: *Floods, *Colorado, Rainfall-runoff relationships, Flood frequency, *Flood data, Hydrologic data, Flood recurrence interval, Peak discharge.
Identifiers: *Denver(Colo).

A light drizzle that began to fall on parts of the Denver metropolitan area late Saturday evening, May 5, 1973, was the forerunner of a general long-duration rainstorm which, by daylight Sunday, had saturated the soils of the area and sent creeks and gullies swelling with runoff. Rainstorm total precipitation ranged from 2.06 to 4.38 inches at U.S. Geological Survey rainfall-runoff stations in the Denver area. By midday on Sunday the small streams had reached their peak discharge; many canal banks, weakened by capacity flows, broke; reservoirs were spilling; and lakes were flooding adjacent areas. Meanwhile, the South Platte River and major tributaries within the storm area were rising toward peak discharges late Sunday night and early Monday morning. The main-stem South Platte River stations from Littleton to Henderson experienced peak discharges ranging in magnitude from that of a 50-year flood to 1.4 times the 50-year flood. (Knapp-USGS)
W74-05171

2F. Groundwater

GEOTHERMAL ENERGY, A NATIONAL PROPOSAL FOR GEOTHERMAL RESOURCES RESEARCH.
Alaska Univ., College.
Available from the National Technical Information Service as PB-216 423; $4.85 in paper copy, $1.45 in microfiche. Final Report of the Geothermal Resources Research Conference, Battelle Seattle Research Center, Seattle, Wash., Sept 18-20, 1972, Alaska University Publication, 1973. 95 p, 4 tab, 123 ref. NSF Project NSF/RA/N-73-003. Grant GI-34313.

Descriptors: *Geothermal studies, *Conferences, Thermal power, Research and development.
Identifiers: *Geothermal energy.

The National Science Foundation, through its RANN Energy Research and Technology Program, supported this geothermal resources research conference under the chairmanship of former Secretary of the Interior Walter J. Hickel. The objective of the conference was to develop an assessment of the state-of-the-art of geothermal science and technology and to recommend a research program to provide the requisite knowledge for establishing the proper role of geothermal resources in providing additional energy to alleviate the Nation's impending shortage. A further objective was to investigate the potential of geothermal water to supplement present national freshwater supplies. The panel topics were: resource exploration, resource assessment, reservoir development and production, utilization technology and economics, environmental effects, and institutional considerations. A research program should include both short range and long range goals. One of the first tasks is to undertake a research program at an adequate level to better define the magnitude of the resource and accelerate its development. Such a program should include: development of binary fluid power-generating systems; development of improved exploration methods; development of desalination methods for geothermal fluids; development of better models of geothermal reservoirs; and development of faster, cheaper methods for deep drilling into hot formations. (Knapp-USGS)
W74-04917

PRACTICAL SIMULATION MODELS OF THE SUBSURFACE HYDROLOGIC SYSTEM WITH EXAMPLE APPLICATIONS,
Auburn Univ., Ala. Dept. of Civil Engineering.
F. J. Molz.
Available from the National Technical Information Service as PB-228 963, $5.50 in paper copy, $1.45 in microfiche. Auburn University, Alabama. Water Resources Research Institute Bulletin 19, 1974. 46 p, 8 fig, 8 tab, 3 append. OWRR A-029-ALA(1).

Descriptors: Groundwater, *Recharge, *Simulation analysis, *Groundwater movement, Hydrologic budget, *Water table, Aquifers, Computer models, Numerical analysis, Model studies, *South America, *Subsurface flow.
Identifiers: *Colombia(So. Amer.).

Several practical models of the subsurface hydrologic system are constructed. These models have as their core the two-dimensional groundwater flow equation with a vertical recharge term and subject to the assumption of horizontal flow. The recharge term is used to represent the hydrologic processes on the surface and in the unsaturated zone as far as their input to the groundwater system is concerned. In this sense, the models can be used to simulate the subsurface hydrology of a watershed--not simply the groundwater system. Various methods are discussed for evaluating the recharge term including a simple water mass balance, a climatological water balance, a more complex water balance and a recharge distribution based on the USDAHL-70 model of watershed hydrology. Application of several of the models to a watershed in Colombia, South America indicates that the models are relatively easy to apply. Solution is obtained using a program developed by Prickett and Lonnquist (1971) which utilizes an alternating direction, line iteration technique. Flow charts, program listings, and example problems are included.
W74-04973

WORTH OF DATA USED IN DIGITAL-COMPUTER MODELS OF GROUND-WATER BASINS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W74-04975

GROUND-WATER RESOURCES OF THE SAN ANTONIO AREA, TEXAS: A PROGRESS REPORT ON STUDIES, 1960-1964,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-04992

SOME CHARACTERISTICS OF FLUORIDE MIGRATION IN GROUNDWATER OF MOLDAVIA (O NEKOTORYKH OSOBENNOSTYAKH MIGRATSII FTORA V PODZEMNYKH VODAKH MOLDAVII),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2K.
W74-05016

FUNDAMENTALS OF KARST SCIENCE. VOLUME 2 (OSNOVY KARSTOVEDENIYA. TOM II),
Perm State Univ. (USSR). Inst. of Karst Studies and Speleology.

G. A. Maksimovich.
Permskiy Gosudarstvennyy Universitet, Perm, 1969. 530 p.

Descriptors: *Karst, *Karst hydrology, *Bibliographies, Subsurface drainage, Carbonate rocks, Limestones, Caves, Groundwater, Aquifers, Artesian aquifers, Hydrogeology, Areal hydrogeology, Structural geology, Folds(Geologic), Erosion, Springs, Rivers, Lakes, Runoff, Geologic time, Maps.
Identifiers: USSR, *Thermokarst, Karst regions.

Volume 2 of 'Fundamentals of Karst Science' represents an expanded approach to the problems associated with the study of karst. Intended for use by hydrogeologists, geologists, geographers, planners, and other professionals engaged in karst investigations, the book is divided into 3 parts: (1) problems of karst hydrogeology (including general, applied, and regional hydrogeology of karst); (2) rivers and lakes of karst regions; and (3) some special types of karst (chalk karst and hydrothermokarst). An extensive bibliography of Soviet and foreign literature is included. (Josefson-USGS)
W74-05017

BOREHOLE GEOPHYSICS AS APPLIED TO GROUNDWATER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W74-05118

EVALUATION OF GROUND-WATER DATA,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 4B.
W74-05119

GROUNDWATER CONDITIONS OF THE TARAI REGION,
Pant Coll. of Tech., Pantnagar (India).
For primary bibliographic entry see Field 4B.
W74-05131

PRELIMINARY STUDIES ON THE MECHANISMS CONTROLLING THE SALINITY IN NORTHWESTERN ARID REGION OF INDIA--A DISCUSSION ON THE CAUSES OF SALINITY IN THE GROUNDWATER REGIME,
Central Groundwater Board, Faridabad (India).
V. Ramesam, and S. K. Barua.
Indian Geohydrology, Vol 9, No 1, p 10-18, June 1973. 2 fig, 12 ref.

Descriptors: *Saline water, *Saline water systems, *Surface-groundwater relationships, Brines, Evaporation, Salinity, Water chemistry, Arid lands, Salts, Evapotranspiration.
Identifiers: *India.

The salinity of surface water bodies cannot be understood independent of the salinity of underlying groundwater. Based on the chemical analytical results of more than 700 groundwater samples from the water table zone of the districts of Kutch, Gujarat, and Jaisalmer, in Rajasthan, India, an attempt was made to understand the mechanism controlling the groundwater chemistry in the arid region of northwestern India. The cation and anion relations with respect to total dissolved solids indicate evapotranspiration and consequent fractional separation of salts as the dominant process rather than proximity to the sea and transportation of saline matter from the sea. (Knapp-USGS)
W74-05132

SPACING OF HARD ROCK SHALLOW WELLS,
Osmania Univ., Warangal (India). Regional Engineering Coll.
For primary bibliographic entry see Field 4B.
W74-05133

PREDICTIVE SIMULATION OF THE SUBSIDENCE OF VENICE,
Centro di Ricerca IBM di Venezia (Italy).
G. Gambolati, P. Gatto, and R. A. Freeze.
Science, Vol 183, No 4127, p 849-851, March 1, 1974. 2 fig, 6 ref.

Descriptors: *Subsidence, *Land subsidence, *Withdrawal, *Artesian aquifers, Compaction, Floods, Seiches, Mathematical models.
Identifiers: *Italy(Venice).

Land subsidence at Venice (Italy) is the result of sediment compaction in the unconsolidated aquifer system that underlies the Venetian Lagoon. Compaction is caused by extensive groundwater withdrawals at the nearby industrial port of Marghera. The total subsidence at Venice for the period from 1930 through 1973 has been about 15 cm. Predictive simulations with a calibrated mathematical model were hampered by the sparseness of available data, but they suggest that if withdrawals are kept constant in the future as they have been since 1969, about 3 cm of further subsidence can be expected. (Knapp-USGS)
W74-05137

GEOTHERMAL RESOURCE INVESTIGATIONS, IMPERIAL VALLEY, CALIFORNIA: SPECIAL REPORT TEST WELL MESA 6-1.
Bureau of Reclamation, Denver, Colo. Lower Colorado Region.
For primary bibliographic entry see Field 4B.
W74-05139

POSSIBLE CAUSE OF FORMATION OF HORIZONTAL HYDROGEOCHEMICAL ZONALITY OF GROUNDWATER IN CENTRAL KAZAKHSTAN (O VOZMOZHNOY PRICHINE VOZNIKNOVENIYA GORIZONTAL'NOY GIDROGEOKHIMICHESKOY ZONAL'NOSTI PODZEMNYKH VOD V TSENTRAL'NOM KAZAKHSTANE),
Leningrad State Univ. (USSR).
G. F. Larionov.
Vestnik Leningradskogo Universiteta, No 6, Seriya Geologiya-Geografiya, No 1, p 59-62, March 1973. 17 ref.

Descriptors: *Geochemistry, *Trace elements, *Groundwater, *Dissolved solids, *Salts, Ions, Ion transport.
Identifiers: *USSR(Kazakhstan), Mineralization.

Most investigators contend that the content of trace elements in waters of varied dissolved-solids content is controlled mainly by the product of solubility and stability of their natural compounds, coprecipitation of microadmixtures with relatively insoluble compounds, and the sorption capacity of rocks. Judging from results of experiments and on-site investigations, these factors are significant only when trace element contents considerably exceed their actual concentrations in natural waters and when there is a sudden change in the conditions of the environment. In all probability, the cause of the relation between salt content in solution and trace element concentration should be sought in the internal structure of molecular processes occurring in groundwater. The concentration of negatively hydrated ions, which include most anions and some cations, increases with increasing dissolved-solids content of natural waters. Between positively hydrated ions (which include almost all cations) and dissolved-solids content of the waters, this relation apparently does not exist. (Josefson-USGS)
W74-05147

GROUNDWATER RESOURCES OF THE VALE OF CLWYD.
Water Resources Board of England and Wales.
For primary bibliographic entry see Field 4B.
W74-05168

GROUNDWATER IN THE NORTHERN WISO BASIN AND ENVIRONS, NORTHERN TERRITORY,
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
For primary bibliographic entry see Field 4B.
W74-05331

NUMERICAL AND ANALYTICAL SOLUTIONS OF DISPERSION IN A FINITE, ADSORBING POROUS MEDIUM,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B.
W74-05334

EXTENSIVE PUMPING FROM UNCONFINED AQUIFERS,
Birmingham Univ., (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-05336

RETENTION BASIN FAILURES IN CARBONATE TERRANES,
Geological Survey of Albama, University. Limestone Hydrology Section.
For primary bibliographic entry see Field 5B.
W74-05337

2G. Water In Soils

DEGRADATION OF PARATHION BY BACTERIA ISOLATED FROM FLOODED SOIL,
Central Rice Research Inst., Cuttack (India). Dept. of Soil Microbiology.
For primary bibliographic entry see Field 5B.
W74-04889

ESTIMATING THE DENSITY OF INDIVIDUAL BACTERIAL POPULATIONS INTRODUCED INTO NATURAL ECOSYSTEMS,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
For primary bibliographic entry see Field 5A.
W74-04890

DETERMINATION OF THE ABSORPTION CAPACITY IN SOILS, (IN RUSSIAN),
N. B. Myakina.
Biol Nauki. Vol 15, No 8, p 136-138. 1972.
Identifiers: *Absorption capacity(Soils), *Soil analysis, *Carbonate soils.

The acetate method for determining the absorption capacity in carbonate soils is as accurate as the standard method and requires less time for mass analyses.--Copyright 1973, Biological Abstracts, Inc.
W74-04947

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-04981

COMPARATIVE CHARACTERISTICS OF DESERT SOILS OF USSR AND AUSTRALIA, (IN RUSSIAN),
L. A. Dorokhov.
Probl Osvoeniya Pustyn', 2p 18-31. 1972, (English summary).
Identifiers: *Australia, Claypans, Climates, *Desert soils, Magnesium, Proluvial soils, Salts, *USSR, *Soil comparisons.

In Australia's arid zone, soil evolutionary history differs from that in desert of USSR. Australian soils are developed from lateritic material formed during intensive weathering in a humid period. The paleosubtropical as well as paleotropical conditions have almost no effect on recent soils in arid lands of USSR. The stony tableland soils (solonetz soils) of Australian arid zone have large amounts of Mg, and thus they may be expected to be similar to vertisols, rather than to Middle Asia grey-brown soils. Sandplain and sandridges of Australia are of proluvial origin, whereas the sand expanses in arid parts of USSR are reworked by powerful river courses. The genesis and morphological characteristics as well as salt profile of claypans strongly resemble those of takyrs. Both types of soils are widespread. The modern soils evolutionary processes show evidence of carbonate and sulfate accumulation which seems to be universal.--Copyright 1973, Biological Abstracts, Inc.
W74-04998

EXPERIMENT IN RAPID LEACHING OF SALINE SOILS IN THE GOLODNAYA STEPPE (OPYT USKORENNOY PROMYVKI ZASOLENNYKH POCHV GOLODNOY STEPI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 3C.
W74-05018

EFFECT OF DIBBLING OF WINTER FALLOW ON HYDROPHYSICAL PROPERTIES OF FROZEN SOIL AND ON EROSION PROCESSES (VLIYANIYE LUNKOVANIYA ZYABI NA VODNO-FIZICHESKIYE SVOYSTVA MERZLOY POCHVY I PROTSESSY EROZII),
I. A. Pabat.
Pochvovedeniye, No 12, p 105-113, 1972. 1 fig, 6 tab, 18 ref.

Descriptors: *Land management, *Fallowing, *Erosion control, *Frozen soils, *Soil physical properties, Bulk density, Compaction, Permeability, Infiltration, Infiltration rates, Soil moisture, Moisture content, Melt water, Snowmelt, Runoff, Slopes, Ice, Freezing.
Identifiers: *USSR(Ukraine), *Dibbling.

Field investigations were made of water and air permeability of frozen soil, melt-water runoff, and soil erosion as a function of soil moisture content, snow accumulation, depth of soil freezing, and fallow cultivation practices on slopes in the central steppe of the Ukraine. Dibbling on slopes was found to reduce to some extent the moisture content and compaction of the upper 10-cm layer of soil between the holes and the depth of freezing under them. This increased the water and air permeability of frozen soil during spring snowmelt, thereby reducing runoff and soil erosion by a factor of 2-10. Destruction of the upper water-impermeable soil layer and of the ice crust by dibbling prior to spring snowmelt may prove to be a reliable and promising method of water conservation and erosion control. Effectiveness of the LOD-10 dibbler in controlling water and wind erosion of soils is noted. (Josefson-USGS)
W74-05019

WATER-HOLDING CAPACITY OF COARSE AND MEDIUM LOESSLIKE LOAMS (O VODOUDERZHIVAYUSHCHEY SPOSOBNOSTI LEGKIKH I SREDNIKH LESSOVIDNYKH SUGLINKOV),
L. G. Balayev.
Pochvovedeniye, No 12, p 92-98, 1972. 2 fig, 9 ref.

Descriptors: *Soil physics, *Soil moisture, *Retention, *Loam, *Loess, Soil water movement, Capillary action, Field capacity, Wetting, Pore water, Equilibrium.
Identifiers: *USSR(Tadzhikistan-northern Causasus).

Moisture content in the zone of aeration of loess was determined in the Vaksh Valley of Tadzhikistan and in the Northern Caucasus. Pore water of loam and clay soils in the moisture range from minimum moisture capacity to interrupted capillary moisture is capable of moving by gravity in the liquid droplet state. Complete moisture equilibrium occurs in the soils at interrupted capillary moisture. A relation was found between mobility of suspended water and moisture content of the underlying soils. Since suspended water of loam and clay soils at minimum moisture capacity is not in a state of equilibrium, the term 'minimum moisture capacity' should be replaced by that of 'field capacity.' (Josefson-USGS)
W74-05020

COMPARATIVE STUDY OF THE PHYSICOCHEMICAL PROPERTIES OF MELIORATED AND NON-MELIORATED SOILS AT THE MUGAN EXPERIMENTAL MELIORATION STATION, (IN RUSSIAN),
I. S. Iskenderov.
Izv Akad Nauk Az SSR Ser Biol Nauk. 1, p 61-65, 1972. Illus.
Identifiers: Alumino-silicates, Filtrability, Hydrophilic, Melioration, *Mineral compounds, *Physicochemical studies, Silicates, *Soils, Swelling, *USSR.

Changes occurred in the hydrophilic properties, filtrability and swelling capacity of the soils in the course of melioration. The mineral component underwent minor changes. Amorphous mineral compounds were more dynamic than the mineral compounds of the aluminosilicate component under melioration and irrigation conditions.--Copyright 1973, Biological Abstracts, Inc.
W74-05037

SOIL RESPIRATION, NITROGEN MINERALIZATION AND HUMUS DECOMPOSITION OF EAST AFRICAN SOILS AFTER DRYING AND REMOISTENING (IN GERMAN),
Forschungsanstalt fuer Landwirtschaft, Braunschweig (West Germany). Institut fuer Bodenbiologie.
G. Jagnow.
Z Pflanzenernaeh Bodenkd, Vol 131, No 1, p 56-66, 1972, English summary.
Identifiers: *Africa, *Humus decomposition, *Mineralization, *Nitrogen, Respiration, *Soils.

Soil respiration and N mineralization of 51 East African cultivated, savanna and forest soils were compared after 3 and 21 wk of air drying. The average soil respiration after 21 wk of drying was 1.221 plus or minus 0.106 times higher than that after 3 wk of drying whereas the average N mineralization was not increased significantly (factor 1.132 plus or minus 0.256). The increase in soil respiration was correlated positively with the water soluble organic matter. During air drying of 3 days and moist incubations of 4 days at 30C, which were repeated 20 times in 10 soils, 3-10% of the organic C and 8-19% of the organic N (low humus vertisol 69%) were mineralized. Changes in the amount and the extinction of humic and fulvic acids were considered to be indicative for an increased humification during the drying and remoistening of soils.--Copyright 1973, Biological Abstracts, Inc.
W74-05054

THE INFLUENCE OF PRECIPITATION AND ALTITUDE ON THE HUMUS CONTENT OF EAST AFRICAN SOILS (IN GERMAN),
Forschungsanstalt fuer Landwirtschaft, Braunschweig (West Germany). Institut fuer Bodenbiologie.
G. Jagnow.
Z Pflanzenernaeh Bodenkd, Vol 131, No 1, p 13-21, 1972, Illus, English summary.
Identifiers: *Africa, Altitude, *Carbon, *Humus, *Nitrogen, Precipitation, *Soils.

Positive correlations were found between the log of the C and N content of the 0-15 cm soil layer, altitude and average annual precipitation of 20 grassland soils, 13 forest soils and 21 cultivated soils at altitudes of 10-2840 m and a precipitation of 380-2410 mm in Kenya, Tanzania and Uganda. For each of the soil groups equations with the 2 variables, altitude and precipitation, were derived, which accounted for 76-93% of the variation of the C (0.42-5.62%) and N (0.04-0.71%) content. There was no correlation between altitude precipitation and the C/N ratio of the soils.--Copyright 1973, Biological Abstracts, Inc.
W74-05058

INFLUENCE OF PARENT MATERIAL AND SLOPE EXPOSURE ON PROPERTIES OF SOILS RELATED TO ERODIBILITY IN NORTH CENTRAL ANATOLIA,
Forstliche Forschungsanstalt, Munich (West Germany). Institut fuer Bodenkunde.
For primary bibliographic entry see Field 2J.
W74-05066

STUDY OF CONDENSED WATER ACCUMULATION IN SANDY DESERT, (IN RUSSIAN),
T. Khodzhamuradov, and M. Kurbannazarov.
Probl Osvoeniya Pustyn'. 2, p 68-70, 1972. English summary.
Identifiers: *Absorption, Condensed water, Deserts, Sands, *Sandy desert, Temperature, Pressure, *Hydroscopicity, *Moisture.

Under the natural conditions, at variable rates of temperature, humidity and pressure, the value of water absorption by sand from the atmosphere exceeds maximum hygroscopicity. During the night atmospheric moisture is accumulated in surface layers and during the day it moves into deeper layers in which diurnal temperature variations occur.--Copyright 1973, Biological Abstracts, Inc.
W74-05115

EOLIAN ORIGIN OF MICA IN HAWAIIAN SOILS,
Oregon State Univ., Corvallis. School of Oceanography.
J. Dymond, P. E. Biscaye, and R. W. Rex.
Geological Society of America Bulletin, Vol 85, No 1, p 37-40, January 1974. 1 fig, 2 tab, 19 ref.
NSF Grants GA-30794X and GX-28671(CLIMAP).

Descriptors: *Aeolian soils, *Clay minerals, *Hawaii, Radioactive dating, Quartz, Mineralogy, Provenance, Soil formation.
Identifiers: Mica, *Oahu(Hawaii).

Mica- and quartz-bearing soils from the high-rainfall regions of the island of Oahu were analyzed for their K-Ar and Rb-Sr age to test for an eolian versus pedogenic origin of the mica. K-Ar and Rb-Sr apparent ages are approximately 100 times greater than the age of volcanism on the island. In addition Sr-87/Sr-86 values for mica-bearing soils are as high as 0.7273 and contrast greatly with the nonradiogenic strontium in Hawaiian lavas (0.703 to 0.707). These measurements show that the potassium- and strontium-bearing minerals of the Hawaiian soils are not of local origin and confirm the importance of eolian transport of mica and clays to the North Pacific. (Knapp-USGS)
W74-05136

EFFECT OF EXCESS MOISTURE ON TRACE ELEMENT DISTRIBUTION IN SOILS OF LININGRAD OBLAST (O VLIYANII IZBYTOCHNOGO UVLAZHNENIYA NA RASPREDELENIYE MICKROELEMENTOV V POCHVAKH LENINGRADSKOY OBLASTI),
Liningrad State Univ. (USSR).
L. L. Dvornikova.
Vestnik Leningradskogo Universiteta, No 6, Seriya Geologiya-Geografiya, No 1, p 78-86, March 1973. 5 tab, 7 ref.

Descriptors: *Soils, *Soil moisture, *Excess water(Soils), *Trace elements, *Geochemistry, Copper, Cobalt, Nickel, Manganese, Boron, Soil profiles.
Identifiers: *USSR(Leningrad Oblast).

Relation of the behavior of mobile forms of trace elements Cu, Co, Ni, Mn, and B to degree of soil wetting was investigated in soil profiles taken on a plowland in the northern part of the Ordovikskoye Plateau in Leningrad Oblast. Studies were conducted on plowed soils formed on calcareous and leached moraine loam and on meadow and forest soils developed under similar natural conditions. The effect of excess moisture on trace element content and distribution throughout the profile is most pronounced in Sod- and Peat-Gley soils. In excessively wet Sod-Podzolic soils nickel accumulates throughout the entire profile, while copper accumulates in the lower gleyed horizons. Changes in Mn, Co, and B concentrations are poorly expressed. Trace elements in Sod-Calcareous soils generally react weakly to periodic excess wetting. (Josefson-USGS)
W74-05148

CESIUM-137 SOIL INVENTORY OF A TAGGED LIRIODENDRON FOREST 1962 AND 1969,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05193

CALCIUM CYCLING: DIFFUSION INTO A FOREST SOIL,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05200

THE SOILS OF THE URAL RIVER ZONE IN THE GUREV REGION AND THEIR IMPROVEMENTS DURING IRRIGATION, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Pochvovedeniya.
E. G. Dzhakishev.
Izv Akad Nauk Kaz SSR Ser Biol. 4, p 1-7. 1972.
Identifiers: *Irrigation, Rivers, *Soils, *USSR(Gureo region), *Ural river.

The natural and soil-meliorative conditions of the Ural river region (USSR) are studied. The region is divided into 7 categories according to the degree of suitability to irrigation.--Copyright 1973, Biological Abstracts, Inc.
W74-05205

CONTENT AND COMPOSITION OF ORGANIC MATTER IN SOD PODZOLIC AND SOD SANDY SOILS OF DIFFERENT DEGREES OF WETTING, (IN RUSSIAN),
L. V. Drechina.
Vestn Beloruss Univ 2.2. p 77-82, 1970.
Identifiers: Coniferous forests, Forests, Fulvic-acid, Humic-acid, Humification, Meadow, Nitrogen, *Organic matter, Plowland, *Podzolic soil, *Sandy soil, Sod soils, Wetting.

The composition of organic matter in light-textured soils of different degrees of wetting under coniferous forests, meadow and plowland, is described. The process of humification in forest soils proceeds mainly with the production of fulvic acids. With the progressive increase of wetting, the ratio of humic acid to fulvic acid (Ch:Cf) increases regularly in forest and meadow soils. The concentration of N in soils and in individual groups of organic matter was determined.--Copyright 1973, Biological Abstracts, Inc.
W74-05237

THE POSSIBILITY OF SODA FORMATION IN SOIL BY BIOCHEMICAL MEANS, (IN RUSSIAN),
P. A. Kerzum, S. I. Vasil'chikova, R. G. Gorbunova, and A. F. Zakharchenko.
Dokl Akad Nauk Tadzh SSR. Vol 15, No 9, p 54-56. 1972.
Identifiers: Biochemical processes, *Calcium carbonate, Soda formation, *Soil chemistry, *Calcium sulfate.

Under laboratory conditions, an experiment was conducted to establish meadow conditions with sub-surface waters and organic materials. It was possible, through a series of reactions, to decrease the CaCO3 level while the CaSO4 level increased in the separated horizons of oxidated soil zones.--Copyright 1973, Biological Abstracts, Inc.
W74-05271

PROBLEMS OF THE ORGANIC MATTER OF ORGANOGENIC SOILS, (IN RUSSIAN),
S. G. Skoropnaov, and V. S. Brezgunov.
Dokl Akad S-Kh Nauk 12. p 20-22. 1972. Illus.
Identifiers: Crop rotation, Drainage, Grain, Grass, Meadow, *Organic matter, *Organogenic soils, *Peat bogs, Reclamation, *Soils, Water storage.

In the reclamation and the agricultural use of organogenic soils (peat bogs), losses of organic matter and transformations of the quality of the organic matter occur. Under certain conditions both factors are undesirable, since the water-storage capacity of the soils decreases. The soil-forming process occurring under the effect of reclamation must be regulated by an optimal degree of draining and by the character of soil use. This is achieved by using the soils for meadow cultivation lowering the groundwater in conformity with the requirements of meadow grasses. The soils may also be used for grain crops-meadow grass rotation.--Copyright 1973, Biological Abstracts, Inc.
W74-05279

HYDRIC REGIME OF AN ARGIUDOL (IN SPANISH),
Universidad Nacional de Tucuman (Argentina).
R. B. Zuccardi, G. S. Fadda, and M. R. Caceres.
Rev Agron Noroeste Argent, Vol 9, No 2, p 347-365, 1972, Illus, English summary.
Identifiers: *Argiudol, *Hydric regime, *Soil moisture.

With slight variations, the period of soil drying starts in May and ends in Oct. In Nov.-April the soil reconstitutes its hydric reserves. These periods coincide in general with the periods of negative and positive hydric balance calculated after Thornthwaite. Small hydric reserves are registered in Oct. The soil normally reaches its highest hydric content in the 50 cm on top in Feb. Hydric contents lower than the wilting point are registered between Sept. and mid-Nov. Moisture contents are high in the surface horizons in Dec.-March.--Copyright 1973, Biological Abstracts, Inc.
W74-05324

WATER REGIME OF SOD PODZOLIC SOILS UNDER SPRUCE FORESTS OF DIFFERENT AGES, (IN RUSSIAN),
For primary bibliographic entry see Field 4A.
W74-05343

INVESTIGATIONS ON THE TRANSFER OF BIOELEMENTS FROM ORGANIC MATTER TO SOIL SOLUTION IN THE HUMUS LAYER OF A BEECH STAND (IN GERMAN),
R. Mayer.
Z Pflanzenernaehr Bodenkd, Vol 131, No 3, p 261-273, 1972, Illus, English summary.
Identifiers: Beech, Bioelements, *Humus layers, Leaf, Organic matter, *Soil solution, *Seepage, *Canopy drip, *Input-output analysis, Lysimeters.

Monthly and annual fluxes of bioelements were measured at 2 levels: at the soil surface (= input) and at the lower boundary of the humus layer (= output) by determination of amount and concentration of the precipitation (canopy drip), of the litter and of the seepage. Seepage was collected with funnel lysimeters. By comparison of both fluxes (input-output-analysis) for some bioelements, mathematical equations could be derived which describe the transfer of these elements from organic matter to soil solution. The results are explained as consequence of the different bonds of the elements in leaf tissues and in humus substances.--Copyright 1973, Biological Abstracts, Inc.
W74-05367

EXPERIENCE OF MEADOW SOIL DESALINATION IN MURGAB OASIS (IN RUSSIAN),
For primary bibliographic entry see Field 3C.
W74-05368

WATER PROPERTIES AND WATER REGIME OF SOD PODZOLIC SOILS AND MEANS OF THEIR IMPROVEMENT (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05370

SOIL-WATER-POTENTIALS DEPENDING ON TEMPERATURE, (IN GERMAN),
Technische Universitaet, Hanover (West Germany). Institut fuer Bodenkunde.
J. Richter.
Z Pflanzenernaehr Bodenkd. Vol 131, No 3, p 254-261. 1972. Illus. (English summary).
Identifiers: *Hysteresis, *Soil water potentials, *Temperature, Clay, Sand.

The soil-water potential of different soils was measured. At -200,000 and -700,000 erg/cc all soils showed a significant dependence of the soil-water potential on temperature in connection with hysteresis phenomena. With soils rich in clay or sand the dependence was most pronounced. At very high suction values (< -700,000 erg/cc erg cm -3) the dependence became small. The measurements agreed well with psychrometric evaluations of Campbell and Gardner on the no-temperature-dependence of the soil-water potential in the range of about -3,000,000 to 20,000,000 erg/cc.--Copyright 1973, Biological Abstracts, Inc.
W74-05372

MOISTURE AND TEMPERATURE REGIMES IN THE SOUTHERN-TAIGA SOILS OF CENTRAL SIBERIA AND HABITAT CONDITIONS FOR CROPS, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05373

EFFECT OF CROPS AND THEIR PREDECESSORS ON THE AGGREGATE COMPOSITION OF MEADOW SIEROZEM SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05374

TOXICITY OF SOD PODZOLIC SOILS LYSIMETRIC SOLUTIONS, (IN RUSSIAN),
G. N. Marshunova.
Byull Vses Nauchno-Issled Inst S-Kh Mikdrobiol. Vol 14, No 3, p 88-92. 1970.
Identifiers: *Fertilizers, Lysimetric solutions, Microorganism, *Sod podzolic soils, Soils, *Toxicity(Yeast), Hydrogen ion concentration.

The toxicity of lysimetric solutions from all horizons of sod podzolic soils was greater in March than in April. Toxicity was expressed in percent destruction of epiphytic yeasts in 24 hr. Insignificant fluctuations in the pH of the soil solutions led to differences in toxicity. The number of microorganisms was higher in April than in March in all horizons. Data are reported on the effect of fertilizers upon the concentration of microorganisms and the toxicity for plants of soil and lysimet-

ric solutions. The toxic substances may be washed out or partially adsorbed in different horizons. The toxicity of aqueous soil extracts is usually weaker than that of lysimetric solutions.--Copyright 1973, Biological Abstracts, Inc.
W74-05375

SOME DATA ON SECONDARY SALINIZATION OF KRASNOZNAMENSKII IRRIGATED MASSIF, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05376

AGROCHEMICAL PROPERTIES AND FORMS OF PHOSPHATES IN TYPICAL SIEROZEMS IRRIGATED AT VARIOUS TIMES, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05377

THE EFFECT OF DIFFERENT TILLAGE METHODS ON THE PHYSICAL PROPERTIES OF SOIL, (IN RUSSIAN),
Grodnenskii Selskokhozyaistvennyi Institut (USSR).
I. S. Mot', and A. M. Karpitskii.
Sb Nauchn Tr Grodnenskii S-Kh Inst. 7. p 108-115. 1970.
Identifiers: Aggregates, Density, *Porosity, *Soil properties, *Tillage, *Sod podzolic soils.

Different tillage methods have different effects on the general porosity of the soil. The lowest bulk density and the largest non-capillary porosity were found in the 10-20-cm layer, whereas in the thoroughly cultivated and the shallow tilled variants they occurred in the 0-10-cm layer. Destruction of soil structure occurs in the fall and winter-spring periods. In the summer partial recovery takes place. Irrespective of the tillage methods the water stability of the aggregates in light-loamy sod podzolic soils is inadequate.--Copyright 1973, Biological Abstracts, Inc.
W74-05378

EFFICACY OF LARGE DOSES OF MINERAL FERTILIZERS IN IRRIGATED SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-05379

2H. Lakes

AN ANALYSIS OF MERCURIALS IN THE ELEPHANT BUTTE ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-04859

A STUDY OF THE RELIABILITY OF CONTINUOUS WATER QUALITY MONITORING,
Tennessee Univ., Knoxville. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W74-04982

WATER MANAGEMENT,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05000

CHARACTERISTICS OF ORGANIC-MATTER DISTRIBUTION IN CALCAREOUS SEDIMENTS OF THE CASPIAN SEA AND IN MESOZOIC CARBONATE ROCKS OF THE SOUTHEASTERN CAUCASUS (OSOBENNOSTI RASPREDELENIYA ORGANICHESKOGO VESHCHESTVA V IZVESTKOVYKH OSADKAKH KASPIYSKOGO MORYA I KARBONATNYKH PORODAKH MEZOZOYA YUGO-VOSTOCHNOGO KAVKAZA),
For primary bibliographic entry see Field 5B.
W74-05021

ANNOTATED BIBLIOGRAPHY ON EFFECTS OF SALINITY AND SALINITY CHANGES ON LIFE IN COASTAL WATERS,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 2J.
W74-05031

BOTTOM FAUNA OF GOLCUK LAKE. 1. POPULATION STUDY OF CHIRONOMIDS, CHAOBORUS AND OLIGOCHAETA,
Aegean Univ., Bornova (Turkey).
For primary bibliographic entry see Field 5C.
W74-05044

PRODUCTION OF A NATURAL POPULATION OF BITHYNIA TENTACULATA L. (GASTROPODA, MOLLUSCA),
Syracuse Univ., N.Y. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-05049

SPATIAL DIFFERENTIATION AND CHANGES IN TIME OF ZOOMICROBENTHOS IN THREE MASURIAN LAKES,
Warsaw Univ. (Poland). Zoological Inst.
For primary bibliographic entry see Field 5C.
W74-05050

SPATIAL DIFFERENTIATION ABUNDANCE OF BACTERIA IN THE WATER OF MIKOLAJSKIE LAKE,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W74-05051

LIMNOLOGICAL SURVEY OF LAKES MICHIGAN, SUPERIOR, HURON AND ERIE,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W74-05067

HYDROBIOLOGICAL STUDIES 2.
Ceskoslovenska Akademie Ved, Prague.
For primary bibliographic entry see Field 5C.
W74-05068

EFFECT OF AN UPSTREAM RESERVOIR ON THE STRATIFICATION CONDITIONS IN SLAPY RESERVOIR,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05069

CHANGES OF SOME CHEMICAL CONSTITUENTS AND BACTERIAL NUMBERS IN SLAPY RESERVOIR DURING EIGHT YEARS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05070

THE CHANGES IN SEVERAL PARAMETERS OF PLANKTON PRIMARY PRODUCTIVITY IN SLAPY RESERVOIR 1960-1967, THEIR MUTUAL CORRELATIONS AND CORRELATIONS WITH THE MAIN ECOLOGICAL FACTORS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05071

THE CHANGES OF BENTHOS IN SLAPY RESERVOIR IN THE YEARS 1960-1961,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05072

LIMNOLOGY OF TWO RE-REGULATION RESERVOIRS IN CZECHOSLOVAKIA,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05073

THE INFLUENCE OF TWO RE-REGULATION RESERVOIRS ON THE CHEMICAL AND BACTERIOLOGICAL PROPERTIES OF RIVER WATER,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
For primary bibliographic entry see Field 5C.
W74-05074

PAN AND LAKE EVAPORATION IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 2D.
W74-05121

THE BIOLOGICAL PATHWAY OF ZINC (ZN-65) IN FRESHWATER FISH AND ITS ALTERATION BY HEAVY METALS,
European Atomic Energy Community, Ispra (Italy). Biology Div.
For primary bibliographic entry see Field 5C.
W74-05201

THE FATE OF COBALT-60 IN A NATURAL FRESHWATER ECOSYSTEM,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
For primary bibliographic entry see Field 5C.
W74-05203

ECOLOGICAL FACTORS AFFECTING THE ACCUMULATION OF CESIUM-137 FALLOUT BY A NATURAL POPULATION OF LARGEMOUTH BASS, (MICROPTERUS SALMOIDES),
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W74-05204

UPTAKE OF RADIOPHOSPHORUS BY ROOTED AQUATIC PLANTS,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W74-05207

STRONTIUM-90 AND CESIUM-137 IN WATER AND DEEP SEDIMENTS OF THE GREAT LAKES,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
For primary bibliographic entry see Field 5C.
W74-05208

UPTAKE OF MOLYBDENUM MARKED WITH MO-99, BY THE BIOTA OF FERN LAKE, WASHINGTON, IN A LABORATORY AND FIELD EXPERIMENT,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5C.
W74-05210

PHILOMETRA NODULOSA IN WYOMING WHITE SUCKERS,
Wyoming Game and Fish Commission, Casper.
For primary bibliographic entry see Field 5C.
W74-05329

BIONOMICS OF CYCLOPS STRENUUS ABYSSORM SARS (COPEPODA:CYCLOPOIDA),
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 5C.
W74-05344

2I. Water In Plants

REDESCRIPTION OF MAPPATES PLATAXUS RANGNEKAR (COPEPODA: CALIGIDAE),
Kerala Univ., Trivandrum (India). Dept. of Aquatic Biology and Fisheries.
M. S. Hameed, and N. K. Pillai.
Hydrobiologia, Vol 42, No 4, p 403-411, September 28, 1973. 18 fig, 15 ref.

Descriptors: *Copepods, *Systematics.
Identifiers: *Mappates platexus, Anurites, Pseudanuretes, Heniocophilus, Eirgos, Animal morphology.

A detailed description of Mappates plataxus is presented. In the light of the present study it is suggested that the closely allied genera Auretes, Pseudanuretes, Heniochophilus, Mappates, and Eirgos do not show any valid generic difference. The suggestion that they may be considered as subgenera under the genus Anuretes is put forth. (Mortland-Battelle)
W74-04877

THE CHARACEAE OF SOUTHEASTERN UNITED STATES,
Rhode Island Univ., Kingston. Dept. of Botany.
For primary bibliographic entry see Field 5A.
W74-04879

TAXONOMY, DISTRIBUTION AND ECOLOGY OF THE GENUS SESARMA (CRUSTACEA, DECAPODA, GRAPSIDAE) IN EASTERN NORTH AMERICA, WITH SPECIAL REFERENCE TO FLORIDA,
Smithsonian Tropical Research Inst., Balboa, Canal Zone.
L. G. Abele.
The American Midland Naturalist, Vol 90, No 2, p 375-386, October 1973. 1 fig, 2 tab, 12 ref.

Descriptors: *Systematics, Ecology, *Ecological distribution, Habitats, Crustaceans, Speciation, Spatial distribution, *Crabs, Invertebrates, *Florida, North America, Marine animals.
Identifiers: *Shore crabs, *Sesarma, Animal morphology, Macroinvertebrates, Driftline crab, Sesarma (Holometopus) cinereum, Sesarma (Holometopus) ricordi, Sesarma (Holometopus) benedicti, Sesarma (Holometopus) miersii, Sesarma (Sesarma) reticulatum, Sesarma (Sesarma) curacaoense, Decapods.

Six species of the grapsid crab genus Sesarma are reported from eatern North America. A key for their identification is presented and their diagnostic characters are illustrated. Their distributions in the western Atlantic are reviewed and a map is given of their distributions in Florida, an area where all six species occur. Field observations on the biology and ecology of four species are presented. Character divergence occurs between two closely related, partially sympatric species. Several factors are suggested to account for the observed patterns of distribution. (Holoman-Battelle)
W74-04880

PHYTOMASS RESERVES IN SOME TYPES OF TUNDRA FROM THE NORTHERN OB RIVER RELATED AREA, (IN RUSSIAN),
Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant and Animal Ecology.
G. V. Trotsenko.
Ekologiya. Vol 3, No 5, p 90-93. 1972.
Identifiers: Phenology, *Phytomass reserves(Trees), Rivers, *Tundra, *USSR(Ob River), *Tree types(Root systems).

Phytomass reserves were determined in tree types of tundra near the Ob river (USSR). Aboveground and root systems were measured and the phytomass determined. The beginning of August was the peak of agreement with data of phenological studies. There was less reserve in the shoot than in the root system.--Copyright 1973, Biological Abstracts, Inc.
W74-04940

ALTITUDINAL VARIATION OF CHLOROPHYLL CONCENTRATION AND REFLECTANCE OF THE BARK OF POPULUS TREMULOIDES,
New Mexico Univ., Albuquerque. Dept. of Biology.
W. W. Covington.
Available from the National Technical Information Service as PB-228 873, $4.75 in paper copy, $1.45 in microfiche. M Sc Thesis, 1972. 32 p, 4 fig, 3 tab, 22 ref. OWRR A-039-NMEX(1).

Descriptors: *Photosynthesis, *Bark, *New Mexico, *Reflection, Deciduous trees, Forests, Elevation, Altitude, Ecosystems, *Chlorophyll, Trees, Plant tissues, Plant pigments, Deciduous forests, Mountain forests, Plant physiology, *Cottonwoods.
Identifiers: Quaking aspen, *Populus tremuloides, Corticular photosynthesis, Corticular chlorophyll.

Chlorophyll concentration and reflectance of bark samples of Populus tremuloides Michx. growing at various elevations in the Sangre de Cristo mountain range of New Mexico indicate that the appearance of greener barked trees at higher elevations is due to the reflectance characteristics of a bloom of dead periderm cells and not to increased chlorophyll concentrations. Chlorophyll concentrations in aspen bark were, in fact, inversely correlated with altitude. The higher concentration of chlorophyll at lower elevations is effectively masked by a white bloom which is also characteristic of exposed site trees. At higher elevations the bloom is yellow-brown and more translucent thus allowing the chlorophyll layers beneath to show through. Therefore, trees at higher elevations appear greener even though they have lower corticular chlorophyll concentrations. The ecological significance of altitudinal variations in chlorophyll concentrations and reflectance of aspen bark is discussed. (Creel-New Mexico)
W74-04977

THE RELATIONSHIP OF SOIL TEMPERATURE AND CYTOKININ PRODUCTION IN ASPEN INVASION,
New Mexico Univ., Albuquerque. Dept. of Biology.
K. R. Williams.
Available from the National Technical Information Service as PB-228 870, $5.25 in paper copy, $1.45 in microfiche. M Sc Thesis, 1972. 39 p, 5 fig, 2 tab, 33 ref. OWRR A-039-NMEX(2).

Descriptors: *New Mexico, *Soil temperature, *Reproduction, *Invasion, Soil analysis, Temperature, Root development, Deciduous trees, Forests, Trees, Deciduous forests, Mountain forests, Soil moisture, Soil-water-plant relationships, Vegetation regrowth, *Cottonwoods, Regression analysis.
Identifiers: *Cytokinin, *Aspen invasion, Populus tremuloides, Quaking Aspen, Thermal regulation, Sprouting.

Quaking aspen (Populus tremuloides Michx.) primarily reproduce by suckering (i.e., root sprouting). Numerous environmental variables have been suggested as causes of this phenomenon, the most notable of which is soil temperature. Studies demonstrating thermal regulation of sprouting indicate the involvement of growth hormones. The only class of hormones to elicit a response similar to sprouting is the cytokinins. Other hormones, no doubt, function in this process as well (e.g., auxins). To substantiate the idea that thermal regulation of sprouting is primarily a function of thermal regulation of cytokinin activity, and to determine the importance of other environmental factors in this scheme, various measurements of field conditions and several laboratory experiments were employed. Regression analyses results indicated that in this subalpine meadow, 91.9% of the variation in soil moisture was accounted for by the silt percentage, and 66% of the variation in soil temperatures was accounted for by soil moisture. Significant relationships exist between numbers of sprouts invading the meadow and soil temperature at each position. Laboratory experiments showed that there exist 'cause-effect' type relationships between soil temperature, cytokinin levels, and sprout production of root sections, and when no factor is severely limiting, sprouting and generally aspen invasion is primarily a thermally controlled process. Thermal control is accomplished through alteration of cytokinin activity levels. (Creel-New Mexico)
W74-04978

SOME ASPECTS OF THE ROLE OF USNIC ACID IN FOREST ECOLOGY,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-04979

RECENT MEASUREMENTS OF CESIUM-137 IN RESIDENCE TIME IN ALASKAN VEGETATION,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5B.
W74-05188

ACCUMULATION OF CE-144 BY HICKORY AND CO-60 BY BLACK GUM SEEDLINGS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05196

VEGETATION OF CENTRAL ANATOLIA AND ITS ECOLOGY,
Ankrana Univ. (Turkey). Dept. of Botany.
For primary bibliographic entry see Field 4A.
W74-05214

EFFECT OF TRACE ELEMENTS ON THE WATER REGIMEN, THE DECORATIVE QUALITIES AND THE SEED YIELD OF SOME ORNAMENTAL PLANTS, (IN RUSSIAN),
Kishinev Botanical Garden (USSR).
For primary bibliographic entry see Field 5C.
W74-05345

INFLUENCE OF SOIL WATER LOGGING DURING SPRING, FOLLOWED BY SUMMER DRYNESS, ON THE BEHAVIOR OF YOUNG PLANTS OF NORWAY SPRUCE, (IN FRENCH),
G. Levy.
Ann Sci For. Vol 28, No 4, p 403-423. 1971. (English summary).
Identifiers: Dryness, Growth, Height, Mortality, Nutrition, Plants, Rooting, *Soil water, Spring, *Spruce(Norway), Summer, Waterlogging.

A greenhouse experiment was conducted using large pots filled with pseudogley soil (A1 and A2)

horizons. There were 4 spring treatments (soil at field capacity, level of water table 7, 14 or 21 cm below the soil surface) and 3 summer treatments (soil at field capacity, watered once a month, watered twice a month) giving a combination of 12 treatments. Data were recorded on highest growth, rooting, mortality and nutrition. A shallow water table in spring followed by severe summer drought was the most unfavorable. All waterlogged roots dried but regrowth took place in summer.--Copyright 1973, Biological Abstracts, Inc.
W74-05348

MICROCLIMATIC CONDITIONS ON THE CUTOVER AREAS OF SHELTERWOOD CUTTINGS, (IN RUSSIAN),
V. E. M. Maksimov.
Nauchn Tr Leningr Lesotekh Akad. 127, p 31-34. 1970.
Identifiers: *Climatic conditions, Cut-over areas, *Cuttings, Humidity, Light, Shelterwood, *Spruce, Temperature.

Indexes of the annual increment of spruce advance growth in 1957-1966 are presented after the initial and the final stages of shelterwood cuttings. The influence of varying conditions of light, temperature and humidity of air and of soil is considered.--Copyright 1973, Biological Abstracts, Inc.
W74-05349

THE PROBLEM OF THE MICROCLIMATE OF THE DRY PINE FOREST, (IN RUSSIAN),
B. M. Kavalyauskas, and I. S. Tomkus.
Liet Tse Modsiu Akad Darb Ser B. 2, p 237-244. 1970. (English summary.).
Identifiers: Air humidity, *Climates, Dry forest, *Pine forests, Radiation, Temperature, Velocity, Winds, *USSR(Lithuania).

Results of the actinometric and gradient meteorological observations in 1968 in a dry pine forest and on an open field in southern Lithuania, USSR, are presented. Only 41% of the total incoming solar radiation reached the forest floor under the pine canopy. The ratio of diffused radiation to the total radiation was 39% in the field, and 50% under the canopy. The average values of the daily totals of radiation balance were 81% lower than in the open field due to the difference in the amount received and the characteristics of the forest floor surface. Data on the temperature of the ground surface and of the air at the height of 0.2 and 1.5 m and the relative humidity of the air showed that the differences between the forest and the field were unimportant. Differences of meteorological data obtained in different weather conditions were important: after rain periods it was colder in the forests than in the field. This was due to difference in wind velocity and in the value of the turbulence coefficient, as well as in the expenditure of heat in warming up the soil.--Copyright 1973, Biological Abstracts, Inc.
W74-05350

AN EXAMPLE OF LONGEVITY OF PINE ON A PEAT BOG, (IN RUSSIAN),
V. G. Rubtsov.
Lesovedenie. 6. p 104-107, 1970. (English summary).
Identifiers: Bogs, Drainage, Morphology, *Peat bog, *Pine longevity, Sphagnum.

Studies were conducted in a 230-yr-old shrub-Sphagnum pine forest. The geomorphological structure of the bog is characterized by drainage and a comparatively high trophic value of the peat. It differs from similar bogs which are confined to the watersheds and hillocky dunes, where the trophic value of peat is low. Shrub-Sphagnum pine forests react differently to drainage depending on the geomorphological structure of forest transitional bogs.--Copyright 1973, Biological Abstracts, Inc.
W74-05351

CONTRIBUTION TO THE METHOD FOR THE DETERMINATION OF SUBLETHAL WATER DEFICIT,
P. Weinberger, M. Romero, and M. Oliva.
Flora (Jena), Vol 161, No 5/6, p 555-561, 1972, Illus, English summary.
Identifiers: Methods, *Sublethal limit, *Water deficit, *Saturation.

The sublethal water deficit is a highly variable feature. By a common statistical procedure, determination of the correlation between water deficit and reachable re-saturation, it is possible to establish a specific value of each species, this value being easily reproducible. This corresponds to a re-saturation of only 90% of the initial maximum value.--Copyright 1973, Biological Abstracts, Inc.
W74-05365

STOMATAL RESPONSES TO CHANGES IN TEMPERATURE AT INCREASING WATER STRESS,
Wuerzburg Univ. (West Germany). Botanisches Institut II.
E. D. Schulze, O. L. Lange, L. Kappen, U. Buschbom, and M. Evenari.
Planta (Berl), Vol 110, No 1, p 29-42, 1973, Illus.
Identifiers: Artemisia-herba-alba, Hammada-scoparia, Humidity, *Israel(Negev), Prunus-armeniaca, Reaumuria-negevensis, *Stomatal response, *Temperature, Water stress, Zygophyllum-dumosum, Transpiration(Plants).

The response of stomata to a gradual increase in temperature at increasing plant water stress was studied in a hot desert habitat (Negev, Israel) in the field, but under controlled temperature and humidity conditions. Four native species (Zygophyllum dumosum, Artemisia herba-alba, Hammada scoparia, Reaumuria negevensis) and 1 cultivated plant (Prunus armeniaca) were used in these studies. The stomatal response to temperature was compared with the response in well-irrigated plants of the same species. At low water stress, the diffusion resistance for water vapor decreased in response to a gradual increase in temperature. Transpiration increased accordingly. This response was reversible. All species responded in the same way. The opening of stomata with increasing temperature was apparently independent of the stomatal response regulated by atmosphere humidity. At high plant water stress, the stomatal response was reversed, i.e., the stomata closed when temperature was gradually increased. This stomatal closure was also independent of the closure regulated by atmospheric humidity. The plant water potential at which the stomatal response to temperature was reversed differed among the species investigated.--Copyright 1973, Biological Abstracts, Inc.
W74-05366

CONTRIBUTION TO KNOWLEDGE OF MAYFLIES OF THE AMUR BASIN: I. IMAGINES (EPHEMEROPTERA:EPHEMERELLIDAE), (IN RUSSIAN),
O. Ya. Baikova.
Izv Tikhookean Nauchno-Issled Inst Rybn Khoz Okeanogr. 77. p 178-206. 1972.
Identifiers: *Ephemerella, Ephemerellidae, Ephemeroptera, Imagines, *Mayflies, *USSR(Amur basin), *Insects, Invertebrates.

For the first time a description is presented of the imaginal forms of 4 spp. of the genus Ephemerella previously known only on the basis of larvae; supplements to the descriptions of imagines are given for other species. The data on the relationship of the segments of the tarsus, tibia and femur of mayflies of the investigated genus and quantitative indices characterizing the size and weight of winged individuals are presented. Information on some aspects of the biology of the species is given. (See also W74-05381)--Copyright 1973, Biological Abstracts, Inc.
W74-05380

CONTRIBUTION TO KNOWLEDGE C MAYFLIES (EPHEMEROPTERA) OF TH AMUR BASIN: II. IMAGINES (RHITHROGEN/ HEPTAGENIA), (IN RUSSIAN),
Izv Tikhokean Nauchno-Issled Inst Rybn Kh Okeanogr. 77. p 207-232. 1972.
Identifiers: Ephemeroptera, *Heptageni Heptagenia-Arsenjevi, Heptagenia-Chinensi Heptagenia-Flava, Heptagenia-Soldatov Imagines, *Mayflies, Rhithrogena, Rhithrogen Imanica, Rhithrogena-Unicolor, *USSR(Am basin), *Insects, Invertebrates.

As a result of breeding winged forms from larva of Rhithrogena un--olor the identity of this speci with R. lepnevae was established. The fema imagines of R. lepnevae are described for the fir time. A description of R. imanica (Ussuri basin) given. A determinative table of similar species Rhithrogena of the Asiatic part of the USSR an Eastern countries is presented. Winged forms Heptagenia soldatovi and H. arsenjevi, previous known only by larvae, are described for the fir time. However, a comparison of the morpholog cal structures of the Polish and Lithuanian larva and imagines of H. flava with the Amur species H arsenjevi did not confirm a difference of thes species. The species H. chinensis, described fro male imagines from China, is recorded for the fir time for fauna of the USSR. A description of th previously known female imagines of this specie is given. The species H. tobiironis, H. yoshida and H. kibunensis are presented for the first tim for the Amur basin in a winged form. A determina tive table of the imaginal stage of all species Heptagenia is presented. (See also W74 05380)==Copyright 1973, Biological Abstracts Inc.
W74-05381

2J. Erosion and Sedimentation

ACKER LAKE LANDSLIDE, MONROE COUN TY, MISSISSIPPI,
Geological Survey, Jackson, Miss.
D. M. Keady, E. E. Russell, and T. J. Laswell.
Available from the National Technical Informa tion Service as PB-228 697 $4.25 in paper copy $1.45 in microfiche. Information Series MGS-73-1 1973. 22 p, 13 fig, 11 ref. OWRR A-058-MISS(2).

Descriptors: *Landslides, *Mass wasting *Mississippi, Joints(Geologic), Frac tures(Geologic), Permeability, Stream erosion Loess, Clays, *Erosion.
Identifiers: *Tombigbee River(Miss.), *Acke Lake(Miss.).

Mass wasting in the Tombigbee Sand Member of the Eutaw Formation (Upper Cretaceous) is a common occurrence on steep bluffs in northeast ern Mississippi. The most recent documented slide occurred on Monday, April 27, 1970, in the vicinity of the small manmade Acker Lake, approximately five miles north of Aberdeen. The 1970 Acker Lake landslide was not the result of a single factor, but was influenced by several variables. Bluffs along the western valley wall of the Tombigbee River are kept steep in the area of Acker Lake principally by the fact that the present channel of the river is against the west valley wall in the immediate area. Acker Lake furnishes a continuing supply of water thus maintaining a high moisture content, with accompanying weight increase in permeable beds. This high moisture content probably increases pore pressure and decreases shearing strength in the sands. Heavy rainfall during March and April of 1970 brought an increase in stream energy thus enabling the Tombigbee River to remove material from the base of slides formed at an earlier period. A continuous clay bed at depth provided a surface along which initial lateral movement could occur. Joints in

Tombigbee Sand, prominent along the bluff face, probably provided passageway for more rapid movement of water than would have otherwise occurred. The conditions that led to the 1970 slide are essentially unchanged, therefore continued sliding of this type is likely. (Knapp-USGS)
W74-04862

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1971.
Water Resources Council, Washington, D.C. Sedimentation Committee.
Available from NTIS, Springfield, Va. 22151, PB-221 081 for $3.00 printed copy; $1.45 microfiche. Water Resources Council Report US-WRC-0100-71, Prepared by National Oceanic and Atmospheric Administration, October 1971. 245 p.

Descriptors: *Sedimentation, *Research and development, Federal government, Sediment transport, Projects, Research facilities.

A digest is presented of information furnished by all Federal agencies conducting sedimentation investigations on work in progress or planned, important findings, new methods, new publications, laboratory and other research activities, and other pertinent information. The material has been organized by major drainage regions in the conterminous United States, Alaska, Hawaii, Puerto Rico, and other foreign countries. Other major headings include laboratory and other research activities. Long-term water quality sites at which sediment data have been collected are listed. (Knapp-USGS)
W74-04916

HYDROLOGIC CHARACTERISTICS OF ALDER CREEK, IRON COUNTY, WISCONSIN,
Geological Survey, Madison, Wis.
For primary bibliographic entry see Field 4A.
W74-04920

CERC BULLETIN AND SUMMARY REPORT OF RESEARCH PROGRESS FOR FISCAL YEARS 1965-66.
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 2L.
W74-04926

SOME MODERN APPROACHES TO BEACH STUDIES,
Woods Hole Oceanographic Institution, Mass.
J. M. Zeigler.
Oceanography and Marine Biology, Annual Review, H. Barnes (Editor), Vol 2, p 77-95, 1964. 3 fig, 3 tab, 60 ref.

Descriptors: Coasts, *Beaches, *Waves(Water), *Sediment transport, Geography, *Currents(Water), Reviews, Equations, Rip currents.
Identifiers: *Wind generated waves, *Longshore currents, *Tidal currents, Solitary waves, Nearshore.

Following a historical approach to beach studies, various physical concepts in the study of beach processes are examined. Modern observations are discussed in terms of water movements. Equations which relate to water movement or qualitative expressions concerning the behavior of water become part of the problem under study, and measurement of the variables in these equations forms the basis for most modern field experiments. Also discussed are concepts concerned with the transport of material. The importance of treating the variables synoptically and, in the field, geographically as well is emphasized. (Sinha - OEIS)
W74-04930

LITTORAL PROCESSES - QUANTITATIVE TREATMENT,10B. LE MEHAUTE.
In: Encyclopedia of Geomorphology. R. W. Fairbridge, Reinhold, p 667-672, 1968. 6 fig, 20 ref.

Descriptors: *Beaches, Geomorphology, *Littoral, Sand spits, Sand bars, *Waves(Water), Rip currents, Coasts, *Currents(Water), Winds.
Identifiers: Longshore transport, Longshore currents, Tombolos, Baymouth bars, Barrier beaches, Mass transport, Nearshore processes.

The origin of beaches and coastal material is described. Two-dimensional wave motion affecting beaches, and waves at an angle and currents affecting beaches are discussed. Illustrations show vertical distribution of mass transport with depth and wind effects noted, longshore transport, rip currents and typical singularities in littoral physiography. The singularities are identified as spits, baymouth bars, barrier beaches and tombolos. (Sinha-OEIS)
W74-04931

NEARSHORE PROCESSES,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W74-04932

SEDIMENTARY RESPONSE TO HYDROGRAPHY IN AN OREGON ESTUARY,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-04934

EXPERIMENTAL DETERMINATION OF RUN-UP OF UNDULAR AND FULLY DEVELOPED BORES AND AN EXAMINATION OF TRANSITION MODES AND INTERNAL STRUCTURE,
Chicago Univ., Ill. Fluid Dynamics and Sediment Transport Lab.
For primary bibliographic entry see Field 8B.
W74-04936

PRECISE CONTROL OF WAVE RUN-UP IN BEACH RIDGE CONSTRUCTION,
Florida State Univ., Tallahassee. Dept. of Geology.
W. F. Tanner, and F. W. Stapor.
Zeitschrift fuer Geomorphologie N. F., Vol 16, No 4, p 393-399, December 1972. 1 fig, 6 ref, 1 photo.

Descriptors: *Beaches, Slopes, Sands, Berms, Sediments, Tides, Waves(Water).
Identifiers: *Wave energy, *Beach ridges, Washover, Tidal range, *Wave run-up, Swash zone.

Beach ridge growth is essentially the work of wave run-up in the swash zone, with little or no washover effects. An approximate method is provided whereby wave height can be estimated from beach ridges. Under given sediment supply and wave conditions, run-up distance and beach face slope are rigidly related. This relationship is such that, with constant wave energy and no tidal change, the waves reach the top of the beach, neither more nor less. If deposition of sand is taking place on the beach, a small berm may be deposited in the upper part of the run-up range. Under constant conditions of deposition, this berm will grow upward and seaward into a beach ridge, having almost all of its internal bedding dipping toward the sea. Highly energetic waves will reach the top of the ridge, but there will be little wash-over. Addition of variability of waves and tide provides only that construction take place in the upper part of the tidal range, under higher-than-average wave energy levels. Elimination of the supply of excess sand puts an end to construction. (Sinha-OEIS)
W74-04939

COASTAL CIRCULATION NEAR KAKINADA BAY DURING MONSOON PERIOD,
Andhra Univ., Waltair (India). Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 2L.
W74-04941

SOME THREE-DIMENSIONAL EFFECTS IN SURF,
Brown Univ., Providence, R.I. Div. of Applied Mathematics.
R. B. Turner, and R. E. Meyer.
Available from NTIS as AD-605 662 for $6.00 paper copy, $1.45 microfiche. Technical Report No. 6, August 1964. 16 p, 1 fig, 4 ref. Nonr 562(34).

Descriptors: *Surf, *Water(Waves), *Shallow water, *Beaches, Equations.

Asymptotic equations are presented of surf on shallow beaches with a geometry causing longshore variations in the water motion. In general, such surf is found to be governed by the three-dimensional, nonlinear shallow-water equations. However, when the seabed profile parallel to shore is shallower than the profile normal to shore, the asymptotic equations are shown to differ only in minor respects from those of two-dimensional surf. Such 'weakly three-dimensional' surf can be analysed directly in terms of the results of the two-dimensional theory. (Sinha-OEIS)
W74-04942

LONGSHORE CURRENTS GENERATED BY OBLIQUELY INCIDENT SEA WAVES,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 2E.
W74-04943

CAUSE AND PREDICTION OF BEACH EROSION,
National Weather Service, Garden City, N.Y. Eastern Region.
S. E. Wasserman, and D. B. Gilhousen.
Technical Memorandum NWS ER-55, November 1973. 11 p, 3 fig, 1 tab, 5 ref.

Descriptors: *Beach erosion, Oceanography, Meteorology, *Littoral drift, *Sediment transport, Sands, Atmospheric pressure, Fetch, Tides, New York, New Jersey.
Identifiers: Long Island(NY), *Wind-driven currents, *Longshore currents.

Oceanographic and meteorological factors involved in beach erosion can be isolated. Surface wind and pressure conditions associated with known beach erosion cases have been presented, and products operationally available to assist in predicting these conditions have been itemized. It is not known how often beach erosion does not occur when the wind and pressure conditions are favorable. Shifting sands, which continuously change near the coastal underwater topography, and tide conditions play an important role in controlling the beach erosion process. While hurricanes and tropical storms do cause major damage along the beaches, they are not considered in this study. The most damaging beach erosion is caused by a fetch directed along the coastline with an onshore component. The wind-driven steep waves stir up the sand and fine gravel and tend to eat away at the beaches. Then a longshore current, or 'littoral drift' is required to transport the loosened sand, if the erosion process is to continue. High tides, that are necessary for the erosion process to penetrate inland above the normal beach line, can be due to storm surges, lessening atmospheric pressure on the adjacent ocean surface, or the direction of the longshore current, in addition to the normal astronomical tides. (Sinha-OEIS)
W74-04945

EDGE BORES,
Tetra Tech, Inc., Pasadena, Calif.
For primary bibliographic entry see Field 8B.
W74-04948

COASTAL MOVABLE BED SCALE MODEL TECHNOLOGY,
Tetra Tech, Inc., Pasadena, Calif.
L-N. Fan, and B. Le Mehaute.
Final Report Tetra Tech No TC-131, prepared for Army Coastal Engineering Research Center, June 1969. 122 p, 20 fig, 9 tab, 68 ref, 2 append. DACW72-68-C-0020.

Descriptors: *Sediment transport, *Coasts, *Waves(Water), *Model studies, Coasts, Data processing.
Identifiers: Littoral transport, Similitude relationships, Scale effects.

The historical development, applications, limitations and basic requirements of coastal movable bed model technology are reviewed. Similitude relationships are established based upon important parameters governing coastal sediment transport. Relationships proposed by previous investigators are critically reviewed. Four basic scale ratios, namely, horizontal scale, vertical scale (or distortion), sediment size and specific weight can be determined from established similitude relationships. Possible scale effects are analyzed. A standard procedure is recommended. This procedure includes data acquisition, data correlation, choice of scales and artificial sediments, preliminary wave tank experiments, adjustment of the model, determination of time scale of bed evolution, interpretation of results and scale effects. A formula is suggested for estimating the time scale of bed evolution due to littoral transport by waves. These results should be useful in both evaluating and utilizing the movable bed model as a tool in coastal engineering problems. (Sinha-OEIS)
W74-04949

ESTUARY AND COASTLINE HYDRODYNAMICS.
For primary bibliographic entry see Field 2L.
W74-04950

COASTAL PROCESSES,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W74-04951

SEDIMENTATION IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W74-04955

THE INTERNAL VELOCITY FIELD IN BREAKING WAVES,
Chicago Univ., Ill. Dept. of Geophysical Sciences.
R. L. Miller, and J. M. Zeigler.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 7, p 103-122, 1964. 9 fig, 27 ref.

Descriptors: *Waves(Water), *Tidal effects, Shores, Coasts, *Shallow water, Shoals, *Sediment transport.
Identifiers: *Breaking waves, *Shoaling, Nearshore processes, Velocity field patterns, Breakers.

The results presented are the first detailed measurements of the horizontal velocity component inside breaking waves. The field study was originally undertaken in 1960 to determine the presence and strength of mid-depthreturn flow under shoaling waves. In the course of the experiment, a series of measurements was made very close to the shore. During one tidal cycle, the instruments became exposed to breakers, and continued to operate. A study of the resulting data showed that detailed velocity measurements could be made within the natural breaker in the field. Accordingly, a series of runs was made and velocity data collected on breakers ranging from very small to storm size. The results very strongly suggest that different breaker shapes have different internal velocity fields. It is possible that the initiation of instability and the subsequent development of the breaker may be characterized by one or several vortex systems, as suggested by the velocity field patterns. The breakers studied were of the type that break directly on the shore and include within the sequence , the runup and backwash from the foreshore. (Sinha - OEIS)
W74-04960

THE COASTLINE OF RIVER-DELTAS,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
For primary bibliographic entry see Field 2L.
W74-04961

THEORETICAL FORMS OF SHORELINES,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
For primary bibliographic entry see Field 2L.
W74-04962

SEASONAL CHANGES IN BEACHES OF THE NORTH ATLANTIC COAST OF THE UNITED STATES,
Army Coastal Engineering Research Center, Washington, D. C.
J. M. Darling.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 15, p 236-248, 1964. 8 fig, 5 tab, 4 ref.

Descriptors: *Beach erosion, *Seasonal, Erosion, Deposition(Sediments), *Tides, New Jersey, New York, Rhode Island, *Waves(Water), Coasts, Storms.
Identifiers: Nearshore processes, Wave period, Wave steepness.

Seasonal changes of eight Atlantic Ocean beaches along the East Coast of the United States from southern New Jersey to Rhode Island have been under study since September 1962. Changes in the beach profiles to date indicate variations on a seasonal basis. Analysis of surveys made at Atlantic City covering a period of little more than one year, indicate marked seasonal differences in beach conditions. The waves during the erosion periods were characteristically of greater steepness than those of the accretion period. The seasonal trend inferred from data for Atlantic City seems to prevail in varying degrees at all the beaches under study, with the possible exception of those fronting on Long Island Sound rather than the Atlantic Ocean. It must be recognized that the actual erosion or accretion does not occur as a continuous pattern, but there are periods which are dominated either by erosion or accretion. These seasonal trends are then the net or resultant behavior pattern. (Sinha - OEIS)
W74-04963

QUASI-WEEKLY AND DAILY PROFILE CHANGES ON A DISTINCTIVE SAND BEACH,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 2L.
W74-04964

WAVE ENERGY AND LITTORAL TRANSPORT,
Laboratorio Nacional de Engenharia Civil, Lisbon (Portugal).
J. Castanho.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 17, p 259-266, 1964. 3 fig, 1 ref.

Descriptors: Bores, *Waves(Water), *Littoral drift, *Sediment transport, Coasts, Energy.
Identifiers: *Wave energy, *Breaking waves.

In this discussion of wave energy and littoral transport, the following aspects are considered: energy dissipated by friction losses; energy contained in the longshore current; and energy dissipated by breaking waves. The momentum method is used in calculating the mean velocity of the longshore current. Energy fractions dissipated in friction losses, breaking losses and solid discharge are also calculated. (Sinha - OEIS)
W74-04965

QUANTITATIVE RESEARCH ON LITTORAL DRIFT IN FIELD AND LABORATORY,
Florida Univ., Gainesville. Coastal Engineering Lab.
P. Bruun, and J. Purpura.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 18, p 267-288, 1964. 11 fig, 2 tab, 25 ref.

Descriptors: *Florida, *Littoral drift, *Sediment transport, Shear stress, Bed load, *Waves(Water), *Currents(Water).

A combined field and laboratory research program is underway to gain quantitative information on littoral drift longshore as well as perpendicular to the shore. The laboratory utilizes modern tracing techniques by luminophores including a scanning (counting of grains) machine and experiments in a wave tank where a current is passed through waters agitated by waves propagating parallel to or perpendicular to the current action. Modes of sediment transport examined are sheet layer movement and transverse movement. In the laboratory, studies have been made on transport by wave action, transport by wave and flow action (propagation unidirectional), and wave and current action operating under an angle with each other. (Sinha - OEIS)
W74-04966

SAND LOSSES FROM A COAST BY WIND ACTION,
California Univ., Berkeley. Coll. of Engineering.
J. W. Johnson, and A. A. Kadib.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 24, p 368-377, 1964. 3 fig, 6 tab, 6 ref.

Descriptors: *California, *Sediment transport, *Wind erosion, *Dunes, *Sands, Equations, *Beach erosion.

A procedure is outlined for the calculation of the annual rate of transport of sand that might be expected to be carried inland from a natural beach by wind action. The procedure involves the beach composition and alinement, the frequency of winds of various speeds from various directions, and a suitable formula to describe the transport. It is possible that the transport formula may be altered as a result of current research; however, the general procedure as outlined should apply. (Sinha - OEIS)
W74-04967

RESIDENCE TIME OF SAND COMPOSING THE BEACHES AND BARS OF OUTER CAPE COD,
Woods Hole Oceanographic Institution, Mass.
J. M. Zeigler, S. D. Tuttle, G. S. Giese, and H. J. Tasha.

In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 26, p 403-446, 1964. 6 fig, 3 tab, 8 ref.

Descriptors: *Sediment transport, *Beaches, *Sand bars, *Erosion, Deposition(Sediments), *Massachusetts.
Identifiers: *Cape Cod(Mass), Residence time.

Residence time is defined as the average number of years a grain of eroded sediment is likely to spend in a specific area before it is transported elsewhere. Sediment seems to take a preferred path, some of it moving along the beach and some along the bars. The time scale is limited to the past seventy years, the time for which data were available. The geographical position is limited to a strip of the east coast of Cape Cod extending seaward to where water depth is about forty feet. The method used to compute residence time involves volume stability. In as much as there is neither gain nor loss of the average volume of sand built features, sand must be moving out of the study area at the same rate it is being introduced. Therefore, the residence time in years is the average volume of a beach or bar divided by the yearly volume of sediment added by erosion to the beach or bar. The east coast of Cape Cod is uniquely situated for a study such as this because sediment is introduced into the definition area only by erosion within the area of the cliffs or sea floor. No sediment or very little of it is introduced into the study area by means of littoral drift. (Sinha - OEIS)
W74-04968

THE ASH WEDNESDAY EAST COAST STORM, MARCH 5-8, 1962. A HINDCAST OF EVENTS, CAUSES, AND EFFECTS,
National Engineering Science Co., Washington, D. C.
C. L. Bretschneider.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 41, p 617-659, 1964. 28 fig, 1 tab, 31 ref.

Descriptors: *Storms, *Winds, *Waves(Water), *Tides, Coasts, Calibrations, *Storm surges, *Beaches, Dunes, Data.
Identifiers: Hindcasts, Gusts.

The material presented represents a hindcast of events during the March 6-8, 1962, storm along the east coast of the United States. Specifically the hindcasts include (1) deep water waves, waves over the continental shelf, waves in shallow water, and waves at the coastline; (2) total tide, including normal predicted tide, storm surge and wave setup; (3) wave run-up on the beach and an estimation of beach berm and dune erosion; (4) wind speeds over water, over the beach, and over the top of the dunes. The hindcasts were checked with available data for the storm. Numerous sources of information on the storm were available to improve the accuracy of the 'state of the art' in forecasting. The so-called 'calibrated methods' for hindcasting were quite suitable for the present storm conditions. (Sinha - OEIS)
W74-04969

COMPARATIVE COSTS OF EROSION AND SEDIMENT CONTROL, CONSTRUCTION ACTIVITIES.
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 4D.
W74-04986

CHARACTERISTICS OF ORGANIC-MATTER DISTRIBUTION IN CALCAREOUS SEDIMENTS OF THE CASPIAN SEA AND IN MESOZOIC CARBONATE ROCKS OF THE SOUTHEASTERN CAUCASUS (OSOBENNOSTI RASPREDELENIYA ORGANICHESKOGO VESHCHESTVA V IZVESTKOVYKH OSADKAKH KASPIYSKOGO MORYA I KARBONATNYKH PORODAKH MEZOZOYA YUGO-VOSTOCHNOGO KAVKAZA),
For primary bibliographic entry see Field 5B.
W74-05021

BASIC PATTERNS IN THE DISTRIBUTION OF CHEMICAL ELEMENTS IN DEEP-SEA SEDIMENTS OF THE BLACK SEA (OSNOVNYYE ZAKONOMERNOSTI RASPREDELENIYA KHIMICHESKIKH ELEMENTOV V TOLSHCHE GLUBOKOVODNYKH OSADKOV CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5B.
W74-05023

MOVEMENT OF WATER ALONG THE SHORE AND NORMAL TO IT IN THE NEAR-SHORE ZONE OF A SHALLOW-WATER COAST,
Akademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.
For primary bibliographic entry see Field 2L.
W74-05028

COMPOSITE ENERGY FLUXES AS FACTORS IN COASTAL FORMATION,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 2L.
W74-05029

ANNOTATED BIBLIOGRAPHY ON EFFECTS OF SALINITY AND SALINITY CHANGES ON LIFE IN COASTAL WATERS,
Texas A and M Univ., College Station. Dept. of Biology.
S. H. Hopkins.
Available from NTIS as AD-767 562, price $8.25 in paper copy, microfiche $1.45. Army Engineer Waterways Experiment Station, Contract Report H-73-2, August 1973. 411 p. DACW39-72-C-0002, DACW73-69-C-0043, DACW73-70-C-0004.

Descriptors: Salt marshes, Coastal marshes, Aquatic habitats, Marsh plants, Marshes, Environment, *Estuaries, *Aquatic animals, *Bibliographies, *Salinity, Coasts, *Biology, *Ecology, *Aquaculture, *Aquatic plants.

Abstracts are given for some 1429 published and unpublished reports dated 1972 and earlier, on physiological and ecological effects of salinity, salinity differences, and changes in salinity on organisms living in estuaries and other coastal waters. Author and subject indexes are included. Authors are listed alphabetically and each author's works are listed chronologically. The subject index provides for cross-indexing by subject. (Sinha - OEIS)
W74-05031

HYDROGRAPHIC ATLAS OF NORTH CAROLINA ESTUARINE AND SOUND WATERS, 1972,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
F. J. Schwartz, and A. F. Chestnut.
Available from NTIS as COM73-11408, price $4.50 in paper copy, microfiche $1.45. Sea Grant Publication UNC-SG-73-12, June 1973. 132 p, 43 fig, 83 tab, 8 ref. SG-04-3-158-40.

Descriptors: North Carolina, *Estuaries, *Water temperature, *Salinity, Sounds, Isotherms, Hydrography.
Identifiers: Isohalines, Atlases.

An atlas of figures, tables, and short text presents water temperature and salinity data for all North Carolina estuarine and sound coastal waters from Virginia to South Carolina except Currituck Sound. Monthly surface and bottom isohalines and isotherms are illustrated. Tables list actual raw determinations for these parameters. (Sinha - OEIS)
W74-05032

RHODE ISLAND'S BARRIER BEACHES: VOLUME II. REPORTS AND RECOMMENDATIONS AT THE COMMUNITY LEVEL,
Rhode Island Univ., Kingston. Coastal Resources Center.
S. B. Olsen, and M. J. Grant.
Available from NTIS as COM73-11045, price $3.00 in paper copy, microfiche $1.45. Marine Technical Report No 4, (A Coastal Management Publication), 1974. 114 p, 17 fig. NOAA Grant.

Descriptors: Rhode Island, *Barrier islands, Coasts, *Beaches, *Management, *Land use, Conservation, Land development, *Community development.

The report is designed to supplement Rhode Island's Barrier Beaches: Volume I - A Report on a Management Problem and an Evaluation of Options. Both documents are elements in a study prepared for the State Coastal Resources Management Council by the University of Rhode Island's Coastal Resources Center. Individual beaches are examined on a community-by-community basis. A consolidated Table of Contents for Volume I and II is included. A location map identifies the barrier beach areas which were studied. Land use and natural feature maps were completed for all barrier beaches and a number of these appear in this volume. (Sinha - OEIS)
W74-05033

NONLINEAR DEVELOPMENT OF THE RAYLEIGH-TAYLOR INSTABILITY IN THE 'SHALLOW-WATER' APPROXIMATION,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 2L.
W74-05034

EXPERIMENTAL STUDIES OF BEACH SCOUR DUE TO WAVE ACTION,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
W. O. Song, and R. E. Schiller.
Available from NTIS as COM73-11745, $4.25 in paper copy. Sea Grant Publication TAMU-SG-73-211, Coastal, Hydraulic, and Ocean Engineering Group Report No. 166 C.O.E., July 1973. 96 p, 31 fig, 2 tab, 40 ref, 4 append. NOAA SG 2-35213, 04-3-158-18.

Descriptors: Coasts, *Beaches, *Scour, Regression analyses, *Waves(Water), *Shallow water, *Sea walls.
Identifiers: Seawall beaches, Standing waves, Beach scour, Wave action.

The processes were investigated involved in the formation of beach scour, caused by wave action, on a natural beach and a seawall beach. Studies also took into account the determination of the reflection coefficient which characterized the wave reflected from both the seawall and the deformed beach profile. The standing wave, formed by the reflection of the waves, was found to be important in the analysis of beach scour phenomena. For the calculation of the reflection coefficient, two methods were used: the envelope method and the Coastal Engineering Research Center (CERC) method. The results showed excellent agreement. The linear standing wave theory was compared with the second order standing wave theory. The wave surface profile and the corresponding horizontal and vertical velocity components of the water particles at the designated points on the free water surface were calculated on the basis of the two theories. The results indicate that the linear standing wave theory gives good results as a first approximation.

To predict the scour depth on the natural beach and the seawall beach, regression analyses were performed. The results gave excellent correlation. (Sinha - OEIS)
W74-05035

AN EVALUATION OF THE EFFECTS OF ESTUARINE ENGINEERING PROJECTS,
Texas Parks and Wildlife Dept. Austin.
For primary bibliographic entry see Field 5B.
W74-05038

WAVE PROPAGATION IN CONTINUOUS RANDOM MEDIA,
California Univ., Los Angeles. Dept. of Mathematics.
C. G. Lange.
Available from NTIS as AD-768 197, price $3.00 in paper copy, microfiche $1.45. Report, 1970. 32 p, 8 ref. ONR Contract N000-14-69-A-0200-4022.

Descriptors: *Waves(Water), Energy, *Stochastic processes, Mathematical studies, Statistics, *Gravity waves, Equations.
Identifiers: Wave propagation, Bottom topography, Random media.

The way in which small random inhomogeneities in a transmission medium affect the statistical properties of a system of waves was studied. Provided the spectral cumulants are sufficiently smooth at some initial time, a sequence of closures for the zeroth order spectral functions can be deduced which describe asymptotically the transfer of energy between wave numbers. Of particular importance is the fact that the closure equations are derived without the need to resort to ad hoc statistical assumptions. The general theory is applied to the problem of the propagation of water waves over an irregular bottom topography. (Sinha - OEIS)
W74-05041

EXISTING AERIAL PHOTOGRAPHIC RESOURCES OF COASTAL GEORGIA AND A BRIEF LISTING OF INTERPRETATIVE AIDS,
Georgia Univ., Sapelo Island. Marine Inst.
R. A. Linthurst, and R. J. Reimold.
Available from NTIS as COM73-11452, price $3.50 paper copy, microfiche $1.45. Sea Grant Publication, Technical Report Series No 73-4, June 1973. 41 p, 34 ref, 7 append, 4 infold maps. NOAA.

Descriptors: Resources, Georgia, *Aerial photography, Coasts, Shallow water, Surveys, Satellites(Artificial), Photogrammetry.
Identifiers: Gemini, Apollo.

The available store of photographic information of the Georgia coast including acquisition, interpretation, and utilization of aerial photography is summarized. Information is given on photogrammetric equipment, photographic systems, aeronautical sectional charts and topographic maps, tidal data, and coastal protection agencies. (Sinha - OEIS)
W74-05042

SEDIMENTARY PROCESSES ON THE CONTINENTAL SLOPE OFF NEW ENGLAND,
Woods Hole Oceanographic Institution, Mass.
J. C. MacIlvaine.
NTIS as AD-768 284, $5.50 in paper copy. Technical Report No. WHOI-73-58, September 1973. 211 p, 51 fig, 4 tab, 64 ref. ONR Contract N00014-66-C0241.

Descriptors: New England, Massachusetts, *Sedimentation, *Continental slope, *Sediment transport, Geomorphology, *Turbidity currents, Creep, Hydrodynamics, Biology.
Identifiers: Cape Cod(Mass), Bottom currents, Quaternary, Oceanographic data, Gravitational processes, Slumping.

A small area of the continental slope south of Cape Cod, Massachusetts was studied. Gravitational processes (slumping, creep, and turbidity currents) are apparently the most effective erosional processes. Massive large-scale failure occurs where the slope steepens from a gradient of 1.5 deg to 7.6 deg, producing scarps hundreds of meters in relief. Smaller scale slumping occurs on the other parts of the continental slope. Material removed by slumping is emplaced at the foot of the continental slope as intact and disrupted blocks 1 to 100 m thick. Turbidity currents generated by slumping have apparently eroded V-shaped gullies in the lower continental slope. Bottom currents are most influential at the shelf break, where they produce sorting of surface sediments and suspension of fine material by erosion of the bottom. Laboratory flume experiments and observations of the bottom indicate that the sediments of most of the continental slope are not normally affected by bottom currents. Biological activity causes both roughening and smoothing of the sediment surface. Tracking of the bottom produces small-scale roughness, and reworking of the bottom reduces larger roughness elements. Biological production of fibrous structures help render the the sediment surface extremely resistant to erosion by bottom currents. (Sinha - OEIS)
W74-05043

INFLUENCE OF PARENT MATERIAL AND SLOPE EXPOSURE ON PROPERTIES OF SOILS RELATED TO ERODIBILITY IN NORTH CENTRAL ANATOLIA,
Forstliche Forschungsanstalt, Munich (West Germany). Institut fuer Bodenkunde.
A. N. Balci.
Z Pflanzenernaeh Bodenkd, Vol 131, No 1, p 42-45, 1972.
Identifiers: Clay, Gravel, *Organic matter, *Slope erosion, Soils, *Turkey(Anatolia), *Soil erosion.

The soils developed from 4 different parent materials in the study area were highly erodible. Parent material has strong influence on soil properties related to erodibility. Dispersion ratio as an index of erodibility and various other soil properties in relation to 4 different parent materials were found to be significantly different. The relative differences in inherent potential erodibility of soils developed from various parent materials may be ranked on the basis of dispersion ratio as follows: Neocene silt greater than Sandstone greater than Andesite greater than Conglomerate. The soils developed on southern slopes were found to be significantly more erodible than those on northern slopes. The relatively better soil stability on northern slopes may be attributed to the significantly higher contents of organic matter and clay fraction. Organic matter contents of surface soil layers (0-15 cm) were found to be significantly higher than those of subsurface (15-30 cm) soil layers. This relation was reserved for gravel content and particle density. Organic matter, gravel, and clay contents of soils showed highly significant inverse associations with dispersion ratio whereas electrical conductivity and silt content indicated significant positive correlation with the erodibility. Several useful relations were found between dispersion ratio and various other soil properties and the results are presented.--Copyright 1973, Biological Abstracts, Inc.
W74-05066

EXPERIMENTAL STUDY OF RIVER INCISION,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
R. G. Shepherd, and S. A. Schumm.
Geological Society of American Bulletin, Vol 85, No 2, p 257-268, February 1974. 20 fig, 3 tab, 29 ref. NSF Grant GA-27726.

Descriptors: *Erosion, *Stream erosion, *Channel erosion, Hydraulic models, Scour, Channel morphology, Flumes.
Identifiers: River incision.

River incision was studied in simulated bedrock, a mixture of sand and kaolinite. Slope, sediment feed, and water discharge were controlled during the development of four channels. After an increase of slope at constant discharge, the following sequence of erosion occurred: (1) development of longitudinal lineations, ripples, and potholes; (2) enlargement of the lineations into prominent grooves; (3) coalescence of the grooves into a single, narrow, and deep inner channel. The inner channel was incised below base level and a sequence of bedrock lows and highs formed. Bedrock scour lows had a weakly regular spacing during incision and a randomly clustered spacing following aggradation. Incision around stabilized alternate bars in a sinuous sand-bed channel resulted in destruction of the bars and maximum scour where the flow was locally constricted. In an initially sinuous bedrock channel, scour depth was greater at bends than at crossings. Provided all of the available sediment load was entrained, the bed was eroded more at convex banks of bends than at concave banks. However, after deposition occurred, the maximum erosion shifted to the concave bank. These results indicate that lateral or vertical incision at bends of incised meandering streams is controlled by the amount of available sediment load entrained by channel-forming discharges. Incised meanders superposed from an earlier pattern on a peneplain should rarely occur in nature, if epeirogenic tilting caused the incision. (Knapp-USGS)
W74-05134

WHAT FUTURE FOR NIAGARA FALLS,
Cornell Univ., Ithaca, N.Y. Dept. of Geological Sciences.
S. S. Philbrick.
Geological Society of American Bulletin, Vol 85, No 1, p 91-98, January 1974. 2 fig, 18 ref, append.

Descriptors: *Erosion, *Waterfalls, *New York, Gradients(Streams), Stream erosion, Geomorphology, Thalweg.
Identifiers: *Niagara River, *Niagara Falls.

The future recession of Niagara Falls up the thalweg of Niagara River is described. The fastest rate of recession occurs in the notched configuration when rock bursts result from high stresses in the rock, as they did several times during the nineteenth century. Conversely, the slowest rate of erosion is during the stable arch configuration such as has prevailed during the first three quarters of the twentieth century. Upstream migration of the Horseshoe Falls will lower the level of the Chippawa-Grass Island Pool below the bottom of the American Channel and unwater the American Falls. The level of Lake Erie may be lowered a few feet at this time. Because the top of the Lockport Formation dips beneath the surface and the Salina rocks appear, the upper part of the valley will cease to be a dolomite cliff and will become a much flatter-sloped outcrop of the less resistant Salina rocks. As the falls recede upstream, the continued upstream dip of the strata will lower the base of the Salina and increase the height of the Salina exposure to produce a distinctly broader, flatter gorge quite different in appearance from the Lockport Gorge. The Final Falls will be much lower than the preceding Horseshoes and may be so slow in recession as to be a quasi-stationary falls, without immediate change in the level of Lake Erie. (Knapp-USGS)
W74-05135

EOLIAN ORIGIN OF MICA IN HAWAIIAN SOILS,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2G.
W74-05136

RHODE ISLAND'S BARRIER BEACHES: VOLUME I, A REPORT ON A MANAGEMENT

PROBLEM AND AN EVALUATION OF OPTIONS,
Rhode Island Univ., Kingston. Coastal Resources Center.
For primary bibliographic entry see Field 2L.
W74-05152

DISTRIBUTION OF CESIUM-137 IN A SMALL WATERSHED IN NORTHERN MISSISSIPPI,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W74-05191

EFFECT OF AN EXCEPTIONAL STORM ON SOIL CONSERVATION AT SAMARU, NIGERIA,
Institute for Agricultural Research, Zaria (Nigeria).
J. Kowal.
Samaru Res Bull. 141, p 163-173. 1972.
Identifiers: Cultivation, *Nigeria(Samaru), Ridges, Runoff, *Soil conservation, *Storms(Severe), Corn(Field), *Erosion control.

An exceptionally heavy storm over the Samaru catchment basin was unevenly distributed. Rainfall ranged from about 6 to 2 inches over a distance of several miles. The peak intensity of the storm reached 11.4 inches/hr with intensities of between 4.7 and 8.5 inches/hour maintained for 25 min. The average rainfall received by the catchment basin was 2.8 inches of which 44% was accepted causing a rise in the water-table of about 14 inches. The remaining 1.6 inches were lost in run-off, about 80% of which drained in 12 hr. A cultivated bench terrace on a uniform slope of 1:320, 200 yards long and with a catchment area of about 0.3 acre, supporting maize on 3-foot ridges gave the highest run-off (57%), while from terraces planted with maize without ridges under similar conditions of slope and catchment area the run-off rate was only 29% to 44% of the rainfall. Soil conservation measures at Samaru farm were effective in rapidly removing a high volume of run-off and in preventing flooding without damage to the main watercourses. The storm considerably reduced the size of ridges often undermining the plant support and causing lodging of certain crops. On the few non-ridged terraces, no excessive erosion was observed and there was no lodging of crops. The safe spacing of graded terraces against rill erosion was tentatively assessed to be an interval of 180 ft at 1.4% slope. The merits of ridges and flat cultivation with and without effective soil conservation measures are discussed. With adequate soil conservation such as that afforded by graded or bench terraces, flat cultivation has many advantages over ridging under mechanized farming.--Copyright 1973, Biological Abstracts, Inc.
W74-05340

PREDICTION OF THE START OF EROSION IN THE LIGHT OF PRINCIPLES OF RELIABILITY THEORY, (IN RUSSIAN),
Ts. E. Mirtskhulava.
Dokl Adad S-Kh Nauk. 12, p 39-41. 1972.
Identifiers: *Erosion, *Model studies, *Prediction, River, Silt, Suspension, *Reliability theory.

The method proposed for predicting the start of erosion with the use of the principles of reliability is imperfect, but it led to the construction of a sufficiently simple model for estimating this important stage of erosion. The value of the study consists not so much in results obtained as in the proof of the possibilities opened by the principles of reliability theory for solving many analogous problems governed by stochastic parameters and overshoots of random functions (suspension, deposition and transport of silt, deformations of river beds, etc.).--Copyright 1973, Biological Abstracts, Inc.
W74-05347

RESULTS OF A SECOND STUDY OF WIND-ERODED SOILS IN THE PAVLODAR PRIIRTYSHYE (IN RUSSIAN),
E. D. Kuzmina.
Biol Nauki, Vol 15, No 10, p 117-121, 1972.
Identifiers: Clays, Sand, Silt, Soils, USSR, Winds, *Soil erosion, *Erosion control, *USSR(Pavlodar Priirtyshye), *Soil treatment.

Results from a 5-yr follow up experiment showed a 10-fold decrease in soil erosion due to application of certain soil protection measures--the increase of sand and clay and the decrease of small or fine sand and coarse silt. Other important factors responsible for controlling erosion were an increase in humus, moisture and annual cultivation of the soil.--Copyright 1973, Biological Abstracts, Inc.
W74-05369

2K. Chemical Processes

TRACE SOLUABLE ORGANIC COMPOUNDS IN POTABLE WATER SUPPLIES,
Iowa State Univ., Ames. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-04855

SELECTIVE CHROMATOGRAPHIC SEPARATION OF URANIUM(VI) ON DEAE-CELLULOSE LAYERS IN DILUTE ACETIC ACID MEDIA,
Chiba Univ. (Japan). Lab. for Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W74-04864

IDENTIFICATION OF AROMATIC NITRILES BY REACTION PAPER CHROMATOGRAPHY,
Vyzkumny Ustav Organickych Syntez, Pardubice (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W74-04865

INTERFACING A PROGRAMMABLE ELECTRONIC CALCULATOR WITH AN AUTOMATIC AMINO ACID ANALYZER,
Richard B. Russell Agricultural Research Center, Athens, Ga.
For primary bibliographic entry see Field 5A.
W74-04866

COULOMETRIC DETERMINATION OF IRON(II)-1,10-PHENANTHROLINE WITH CERIUM(IV),
Maryland Univ., College Park. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-04867

DETERMINATION OF EIGHT METALS IN THE INTERNATIONAL BIOLOGICAL STANDARD BY FLAMELESS ATOMIC-ABSORPTION SPECTROMETRY,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany).
For primary bibliographic entry see Field 5A.
W74-04868

VOLTAMMETRIC BEHAVIOUR OF COPPER(III) AND ITS ANALYTICAL APPLICATIONS,
Siena Univ. (Italy). Istituto di Chimica Generale.
For primary bibliographic entry see Field 5A.
W74-04870

DETERMINATION OF THE ABSORPTION CAPACITY IN SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W74-04947

SOME CHARACTERISTICS OF FLUORIDE MIGRATION IN GROUNDWATER OF MOLDAVIA (O NEKOTORYKH OSOBENNOSTYAKH MIGRATSII FTORA V PODZEMNYKH VODAKH MOLDAVII),
Leningrad State Univ. (USSR).
Ye. V. Petrakov, E. V. Kozlova, and N. A. Sargsyants.
Vestnik Leningradskogo Universiteta, No 12, Geologiya-Geografiya, No 2, p 74-77, June 1973. 4 fig, 1 tab, 6 ref.

Descriptors: *Water quality, *Fluorides, *Groundwater, Groundwater basins, Aquifers, Artesian aquifers, Rocks, Geologic time, Inorganic compounds, Salts, Alkaline water, Water temperature, Hydrogen ion concentration, Oxidation-reduction potential, Curves.
Identifiers: *USSR(Moldavia), Mineralization.

Fluoride concentrations in alkaline waters of the Moldavian artesian basin are extremely high, reaching 20 mg/liter in waters of Riphean-Eocambrian rocks and 13.5 mg/liter in waters of Silurian, Cretaceous, and Lower Sarmatian rocks. On the basis of its high rate of migration in alkaline waters of the basin, fluoride belongs to the category of very mobile and readily mobile elements. A relation is established between groundwater mineralization and fluoride content. Maximum fluoride concentrations correspond to a mineralization of 2-5 g/liter for waters of sedimentary rocks and 1-2 g/liter for waters of metamorphic rocks. With a further increase in mineralization, the amount of fluoride in groundwater decreases sharply. The chemical composition of groundwater has a positive effect on the leaching of fluoride from rocks and on fluoride migration. An increase in Na2CO3 and NaHCO3 concentrations results in a higher fluoride content in groundwater and intensifies fluoride migration; an increase in CaCO3 content retards fluoride migration. A change in pH, Eh, and water temperature has little effect on the fluoride concentration in groundwater of the Moldavian artesian basin. (Josefson-USGS)
W74-05016

MIGRATION OF ELEMENTS IN RIVER WATERS (MIGRATSIYA ELEMENTOV V RECHNYKH VODAKH),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 5B.
W74-05022

BASIC PATTERNS IN THE DISTRIBUTION OF CHEMICAL ELEMENTS IN DEEP-SEA SEDIMENTS OF THE BLACK SEA (OSNOVNYYE ZAKONOMERNOSTI RASPREDELENIYA KHIMICHESKIKH ELEMENTOV V TOLSHCHE GLUBOKOVODNYKH OSADKOV CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
For primary bibliographic entry see Field 5B.
W74-05023

CHEMICAL ASPECTS OF UNDERGROUND WATER,
Commonwealth Scientific Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 4B.
W74-05080

CHEMICAL COMPOSITION OF MONSOON RAINWATER OVER CHANDIGARH IN 1971,
Central Groundwater Board, Faridabad(India).
For primary bibliographic entry see Field 2B.
W74-05130

PRELIMINARY STUDIES ON THE MECHANISMS CONTROLLING THE SALINITY IN NORTHWESTERN ARID REGION OF INDIA--A DISCUSSION ON THE CAUSES OF SALINITY IN THE GROUNDWATER REGIME,
Central Groundwater Board, Faridabad (India).
For primary bibliographic entry see Field 2F.
W74-05132

POSSIBLE CAUSE OF FORMATION OF HORIZONTAL HYDROGEOCHEMICAL ZONALITY OF GROUNDWATER IN CENTRAL KAZAKHSTAN (O VOZMOZHNOY PRICHINE VOZNIKNOVENIYA GORIZONTAL'NOY GIDROGEOKHIMICHESKOY ZONAL'NOSTI PODZEMNYKH VOD V TSENTRAL'NOM KAZAKHSTANE),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2F.
W74-05147

EFFECT OF EXCESS MOISTURE ON TRACE ELEMENT DISTRIBUTION IN SOILS OF LININGRAD OBLAST (O VLIYANII IZBYTOCHNOGO UVLAZHNENIYA NA RASPREDELENIYE MICKROELEMENTOV V POCHVAKH LENINGRADSKOY OBLASTI),
Liningrad State Univ. (USSR).
For primary bibliographic entry see Field 2G.
W74-05148

MIXTURE, A COMPUTER PROGRAM FOR THE CALCULATION OF HOT WATER TEMPERATURE AND MIXING FRACTIONS OF LARGE VOLUME WARM SPRINGS OF MIXED WATER ORIGIN,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W74-05156

GENERAL REPORT ON DEVELOPMENT AND UTILIZATION OF SALINE SOILS IN IRAN,
Jondi Shahpour Univ., Ahvaz (Iran).
For primary bibliographic entry see Field 3C.
W74-05218

FLUORIMETRIC METHOD FOR THE DETERMINATION OF URANIUM IN NATURAL WATERS,
Geological Survey of Sweden, Stockholm.
For primary bibliographic entry see Field 5A.
W74-05240

FIELD IONIZATION MASS SPECTROMETRY: A NEW TOOL FOR THE ANALYTICAL CHEMIST,
Stanford Research Inst., Menlo Park. Calif.
For primary bibliographic entry see Field 5A.
W74-05302

GRADIENT TITRATION-A NOVEL APPROACH TO CONTINUOUS MONITORING USING ION-SELECTIVE ELECTRODES,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
B. Fleet, and A. Y. W. Ho.
Analytical Chemistry, Vol 46, No 1, p 9-11, January 1974. 5 fig, 1 tab, 16 ref.

Descriptors: *Volumetric analysis, *Aqueous solutions, *Automation, Methodology, Monitoring, Flow rates, Sulfides, Ions, Automatic control, Chemical analysis, Pollutant identification.
Identifiers: *Ion selective electrodes, *Continuous monitoring, *Gradient titration, Reagents, Sulfied electrodes, Membrane electrodes, Accurary, Endpoint sensors.

A new approach to the automation of titration processes using ion-selective electrodes is described. Based on the gradient titration principle, the method involves the semicontinuous monitoring of a sample stream with a reagent stream where the concentration of the latter increases linearly in the form of a gradient. The flow rates of both sample and reagent streams are maintained constant, and a suitable ion-selective electrode monitors the approach to the equivalence point. The method is, in principle, the constant volume analog of conventional titrimetry. The results obtained for the determination of sulfide ion using mercuric nitrate as gradient reagent and a sulfide membrane electrode are presented. The initial study has shown that the gradient titration technique is experimentally feasible when an appropriate ion-selective electrode with a rapid response is available as the end-point sensor. No sophisticated potential measuring device is required; simple, inexpensive operational amplifier modules can be used for the potential readout. The procedure as described is not fully automatic, however, with part of the sample (and reagent titrant) handling step being done manually. Full automation, however, is possible by incorporating a modified Technicon Sampler into the system. (Holoman-Battelle)
W74-05303

INVESTIGATION OF THE FACTORS AFFECTING THE RESPONSE TIME OF A CALCIUM SELECTIVE LIQUID MEMBRANE ELECTRODE,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
B. Fleet, T. H. Ryan, and M. J. D. Brand.
Analytical Chemistry, Vol 46, No 1, p 12-15, January 1974. 4 fig, 3 tab, 40 ref.

Descriptors: Effects, Calcium, Cations, Selectivity, Lead, Magnesium, Strontium, Zinc, Cadmium, Copper, Sodium, Hydrogen, *Electrodes.
Identifiers: *Liquid membrane electrodes, *Calcium electrodes, *Ionic interference, Response time, Data interpretation, Ion selective electrodes, Ion activity, Barium.

Measurements on the response time of a Calcium Selective Liquid Membrane Electrode are reported and a new parameter t sub 95 is proposed as being a more representative measure of electrode performance than the more widely used t sub 1/2. The former value is of more importance in assessing the performance of an electrode in real analytical situations. The effect of various interfering ionic species on the response time of the electrode is investigated and ions tested have been divided into three groups according to their effect on the response time. An interpretation of this division is proposed on the basis of the kinetics of the reaction of the interferent ion with the membrane site species and conventional selectivity ratios. It has been shown that a calcium liquid membrane electrode responds rapidly and reproducibly to step changes in calcium ion activity, with response time of the order of a few seconds. Also interfering ions can have a marked effect on the electrode response time and this cannot always be predicted from a knowledge of the selectivity constant. Where the selectivity constant is very small, it may be assumed that no effect on response time will be observed. For interfering ions with moderate to large selectivity constants, an increase in electrode response time will be observed when the kinetics of the interferent ion reactions become rate limiting. (Holoman-Battelle)
W74-05304

DETERMINATION OF TRACE AMOUNTS OF C2-C5 ACIDS IN AQUEOUS SOLUTIONS BY GAS CHROMATOGRAPHY,
Rome Univ. (Italy). Istituto di Chimica Analitica.
For primary bibliographic entry see Field 5A.
W74-05314

2L. Estuaries

THE EFFECTS OF HURRICANE CAMILLE ON THE MARSHES OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
R. H. Chabreck, and A. W. Palmisano.
Ecology, Vol 54, No 5, p 1118-1123, Late Summer 1973. 1 fig, 3 tab, 18 ref.

Descriptors: *Hurricanes, *Freshwater marshes, Aquatic plants, *Salt marshes, *Marine plants, *Environmental effects, Soil chemistry, Water chemistry, Mississippi River, Deltas, Water sampling, Marsh plants, Coastal marshes, Water analysis, Soil analysis, Brackish water, Organic matter, Alligatorweed, Floating plants, Willow trees, Water hyacinth, Vegetation, Amphibious plants, Rooted aquatic plants, Widgeon grass.
Identifiers: *Mississippi River Delta, Recovery, Macrophytes, Organic carbon, Phragmites communis, Myriophyllum spicatum, Alternanthera philoxeroides, Lemna minor, Eichhornia crassipes, Duckweed, Reed grass, Distichles spicata, Scirpus robustus, Spartina patens, Salix nigra, Balck willow, Bulrush, Species abundance, Vetch, Aster, Water hyssop, Southern swamplilly, Water pennywort, Common frog-fruit, Narrow-leaved cattail, Great duckweed, Chicken spike, Smooth cordgrass, Big cordgrass, Saltmeadow cordgrass, Goldenrod.

The active delta of the Mississippi River was sampled in August 1968 to determine plant species composition, plant coverage, and soil and water chemistry. Hurricane Camille struck this area in August 1969, with winds in excess of 200 km/h and tides ranging upward to 5.2 m above MSL. The delta was resampled 2 weeks following the hurricane to evaluate the immediate effects on vegetation, soil, and water, and again 1 year after the hurricane to determine the recovery rate of vegetation. The hurricane resulted in a drastic reduction of vegetation. Regrowth was rapid in the delta marshes and after 1 year plant coverage approached pre-hurricane levels of abundance; however, recovery was slower in ponds and lakes. The loss of vegetation was mainly a result of the sweeping action of wind and water, and plants were either uprooted or ripped apart and carried away by the current. Water salinity increased with the hurricane but declined by the following year and appeared to have only slight effect on marsh vegetation. Plant species varied in their response to the hurricane. Bacopa monnieri showed practically no effect, and Phragmites communis and Spartina alterniflora were reduced only slightly. Myriophyllum spicatum, Panicum repens, and Alternanthera philoxeroides were greatly reduced by the storm; and after 1 year, only Alternanthera philoxeroides showed significant recovery. (Holoman-Battelle)
W74-04875

CURRENTS AROUND THE HAWAIIAN ISLANDS. A STUDY OF COASTAL CURRENTS IN RESPECT TO SEWAGE DISPOSAL,
Hawaii Inst., of Geophysics, Honolulu.
For primary bibliographic entry see Field 5B.
W74-04925

CERC BULLETIN AND SUMMARY REPORT OF RESEARCH PROGRESS FOR FISCAL YEARS 1965-66.
Army Coastal Engineering Research Center, Washington, D.C.
Vol II, 1965-66. 76 p.

Descriptors: *Coastal engineering, Coasts, Beaches, *Waves(Water), *Currents(Water), *Tides, *Storms, *Florida, *North Carolina, Instrumentation, Sampling, Sediments.
Identifiers: Longshore currents, Breakers, Surf zone, Sea sleds, Wave action, Nearshore processes.

This issue contains seven articles of interest to those concerned with coastal, estuarine, and nearshore processes. These are: Effect of Wave Action on Tidal Stages Along the Coast of Florida, March 1962; Longshore Currents at Nags Head, North Carolina; Study of Pilot Beaches in New England for the Improvement of Coastal Storm Warning; The Sears Sea Sled for Surveying in the Surf Zone; Heights of Waves Generated by a Flap-Type Wave Generator; Scuba Diving to Investigate InSitu Behavior of Mobile Suspended-Sediment Sampler; and Progress Reports on Research Sponsored by the Coastal Engineering Research Center. (See W74-04927 and W74-04928) (Sinha - OEIS)
W74-04926

EFFECT OF WAVE ACTION ON TIDAL STAGES ALONG THE COAST OF FLORIDA, MARCH 1962,
Army Engineer District, Jacksonville, Fla.
M. Lazarus, and C. L. Nowlin.
In: CERC Bulletin and Summary Report of Research Progress for Fiscal Years 1965-66, Vol II, p 1-10, 1965-66. 5 fig, 2 tab, 5 ref.

Descriptors: *Florida, *Storms, Wind tides, Tidal effects, *Atmospheric pressure, Energy, *Waves(Water), Coasts, Beaches.
Identifiers: United States East Coast, Swells, Wave action, Barometric pressure, Long-period waves.

The northeast storm of 5-9 March 1962 was one of the more severe storms which have battered the east coast of the United States in recent times. It caused very severe damage from Long Island to the Outer Banks of North Carolina and significant damage from Maine to Florida. The entire Florida coastline was affected by long-period swells, although it was far from the center of the storm and the winds which generated them. Unusually high tides which could not be attributed entirely to the effect of local winds were observed during this period. Some instances are discussed of observed tidal behavior where the departures from predicted values are attributed to the effect of long-period waves. Examination of tidal data from stations distributed along the Florida coast during this storm incident shows a definite increase in tidal stage due to energy absorbed from wave action - i.e., wave effect - rather than wind set-up or barometric pressure. (See also W74-04926) (Sinha - OEIS)
W74-04927

LONGSHORE CURRENTS AT NAGS HEAD, NORTH CAROLINA,
Army Coastal Engineering Research Center, Washington, D.C. Research Div.
C. J. Galvin, Jr., and R. P. Savage.
In: CERC Bulletin and Summary Report of Research Progress for Fiscal Years 1965-66, Vol II, p 11-29, 1965-66. 7 fig, 4 tab, 7 ref.

Descriptors: *North Carolina, *Beaches, *Slopes, *Currents(Water).
Identifiers: Outer banks(NC), *Longshore currents, *Breakers, Surf zone, Velocity measurement.

Longshore current velocity and associated wave and beach conditions were measured during 5 days in March 1964, along a beach on the Outer Banks of North Carolina. Velocity measurements, obtained by repeatedly timing the travel, over a 200-foot distance, of free-floating balloons filled with fresh water, did not indicate a pulsating flow for the longshore current during the time of measurement and over the distance traveled by the floats. Breaker angle, the variable most closely correlated with current velocity, was measured by Brunton compass, by triangulation on a buoy at the breaker line, and by measurement of the velocities of the crest and plunge point of the breaking wave. Wave height and wave period were measured from wave gage records and by visual estimation. Beach slopes beneath the surf zone, measured from profiles supplied by the Louisiana State University field station at Nags Head, varied from 0.026 to 0.030. In four of the five sets of data obtained, the measured velocity (1.3 to 4.3 feet per second) differed by 0.1 and 1.0 foot per second from that predicted by two very different equations for longshore current velocity. (See also W74-04926) (Sinha - OEIS)
W74-04928

A REVIEW OF ESTUARINE MODELING,
New York Univ., Bronx. Dept. of Meteorology and Oceanography.
J. E. Overland.
In: Proceedings 18th Annual Technical Meeting, Institute of Environmental Sciences, May 1972. p 178-185 (1972). 2 fig, 2 tab, 21 ref.

Descriptors: *Simulation analysis, *Model studies, Equations, Friction, Turbulence, *Estuaries, *Water quality, Hydrodynamics, *Reviews, Path of pollutants.

Some of the current hydrodynamic and water quality estuarine models and the physical assumptions associated with them are reviewed. Technically, there is a distinction between modeling and simulating a physical system. Simulation implies correlating a large amount of data for a curve of best fit and to use this functional dependence for prognostication. Modeling implies starting from basic physical principles and deducing the behavior of more complex processes. Representation of estuaries is usually a combination of both techniques; one usually proceeds as far as possible on physical grounds, but finally fits the model to the prototype by judicious choice of unknown parameters in the equations, usually those associated with friction or turbulence. (Sinha - OEIS)
W74-04929

NEARSHORE PROCESSES,
Scripps Institution of Oceanography, La Jolla, Calif.
D. L. Inman.
In: Encyclopedia of Science and Technology. McGraw-Hill Book Company, Inc., 1971. 8 p, 8 fig, 10 ref.

Descriptors: *Coasts, *Beaches, *Waves(Water), Reviews, *Sediment transport, *Currents(Water).
Identifiers: Surf zone, *Nearshore processes, Circulation cells, Biological effects, Longshore currents, Beach cusps.

The establishment and persistence of natural sand beaches are often the result of a delicate balance among a number of factors, and any changes, natural or man-made, tend to upset the equilibrium. Explanations are given on waves, currents in the surf-zone, the formation of circulation cells, beach types, beach cycles, beach cusps, the mechanics of beach formation, longshore movement of sand, and the source of beach sediments. The rigor of wave action and the continually shifting substrate make the sand beach a unique biological environment. Since the beach-forming processes and the trapping of material by currents and sand are much the same everywhere, the animals found on sand beaches throughout the world are similar in aspects and habits. (Sinha-OEIS)
W74-04932

ON THE MEASUREMENT OF TURBULENCE IN ESTUARIES,
Connecticut Univ., Groton. Marine Sciences Inst.
For primary bibliographic entry see Field 5B.
W74-04933

SEDIMENTARY RESPONSE TO HYDROGRAPHY IN AN OREGON ESTUARY,
Oregon State Univ., Corvallis. Dept. of Oceanography.
L. D. Kulm, and J. V. Byrne.
Marine Geology, and Minneapolis were studied within an area whose natural groundwater flow is largely towards the center of the metropolitan area. This area coincides with the extent of the Hinckley Sandstone aquifer. Greater emphasis is placed on the area underlain by the Prairie du Chien-Jordan aquifer (about 2,000 square miles), from which approximately 75% of the groundwater for the metropo

W74-04934

SEA SURFACE TEMPERATURE AND SALINITY CONDITIONS IN 1969 AT AGATE BEACH AND YAQUINA BAY, OREGON,
Oregon State Univ., Corvallis. Dept. of Oceanography.
J. J. Gonor, and A. B. Thum.
Available from NTIS as AD-703 662 for $6.00 paper copy, $1.45 microfiche. Data Report No. 39, prepared for Office of Naval Research, Reference 70-1, February 1970. 24 p, 1 fig, 3 tab. N00014-67-A-0369-0001.

Descriptors: *Oregon, Coasts, *Temperature, *Salinity, *Upwelling, Tides, *Seasonal, *Estuaries.
Identifiers: Agate Beach(OR), Yaquina Bay(OR), Sea surface temperature.

Daily temperature and salinity conditions measured in the surf at Agate Beach, Oregon are summarized by 15 day periods for 1968 and 1969. For each period the number of observations, the high, the low, the mean and the standard deviation of the temperature and salinity measurements are tabulated. Daily data for 1969, derived from afternoon measurements are also given. A map indicating the stations is included, and the data are briefly discussed with the differences between the two years emphasized. The late occurrence of upwelling in 1969 accounts for the major differences between the two years. A water surface temperature station approximately 3 miles inside the mouth of Yaquina Bay was maintained in 1968 and 1969 by use of continuously recording thermographs. Daily data are given, starting in April, 1968, of surface temperature at higher high, lower low, lower high, and higher low waters. The influence of the state of the tide on bay temperatures, as well as that of other seasonal hydrographic phenomena are evident in the tabulations. (Sinha-OEIS)
W74-04935

NEAR-SURFACE OCEANIC DIFFUSION FROM A CONTINUOUS POINT SOURCE,
New York Univ., Bronx. Dept. of Meteorology and Oceanography.
R. L. Reinert.
In: Symposium on Diffusion in Oceans and Fresh Waters Lamond Geological Observatory, Palisades, New York, Aug/Sept 1964. T. Ichiye (editor), p 19-27, December 1965. 6 fig, 4 ref. Nonr 285(57).

Descriptors: Dyes, Tracers, *Diffusion, *Winds, *Waves(Water), *New York.
Identifiers: *Long Island Sound, Continuous point source.

Results and discussion of a dye experiment in Long Island Sound are presented. Special attention is paid to conditions that affect small scale diffusion. The experiment is performed during a time of constant tidal current and steady winds. Cross-plume concentration data and aerial photographs are included. These data show interesting patterns thought to be due to the effects of wind and waves. (Sinha-OEIS)
W74-04937

DIFFUSION EXPERIMENTS IN COASTAL WATERS USING DYE TECHNIQUES,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
T. Ichiye.
In: Symposium on Diffusion in Oceans and Fresh Waters, Lamont Geological Observatory, Palisades, New York, Aug/Sept 1964. T. Ichiye (editor), p 54-67, December 1965. 4 fig, 18 ref. AEC-AT(30-1)2663, Nonr 266(48).

Descriptors: Dyes, Tracers, *Diffusion, Coasts, *New Jersey.
Identifiers: Shearing currents, Bahama Banks, Long Island, Langmuir circulation, Ekman spiral, *Wind current, *Drift current, *Eddy viscosity.

The data obtained from dye experiments off New Jersey coast, on the Bahama Banks and south of Long Island since 1961 are analyzed. The areas of a visually demarcated dye patch are determined from concentration measured with fluorometers and compared with the mean square separation of a two-particle theory of diffusion, yielding t(2) and t(3) law for small and large time t respectively. Elongation of dye patches is interpreted as vertically differential advection due to a shearing current. Striations are discussed as caused by helical vortices which may be also a cause of Langmuir circulation. The curvature of the tail part of a dye patch is attributed to the Ekman spiral in a pure wind current, because, in most cases, curved tails were observed for moderate winds and in waters deeper than 20 m and because the curvature is clockwise from head to tail in the northern hemisphere. A modified theory of a drift current with eddy viscosity decreasing exponentially with depth is developed and compared with patterns of dye patches. (Sinha-OEIS)
W74-04938

COASTAL CIRCULATION NEAR KAKINADA BAY DURING MONSOON PERIOD,
Andhra Univ., Waltair (India). Dept. of Meteorology and Oceanography.
R. Ramanadham, B. S. Reddy, and K. R. G. K. Murty.
Pure and Applied Geophysics, Vol 89, p 183-191, 1971. 6 fig, 1 tab, 3 ref.

Descriptors: Bays, Coasts, *Waves(Water), *Currents(Water), *Tides, *Monsoons, *Circulation, Sea breezes, Land breezes, Sand bars, Geomorphology.
Identifiers: *India(Kakinada Bay), Bay of Bengal.

An intensive study was made of currents in the coastal vicinity of Kakinada Bay and Godavari Point on the east coast of India. The circulation has high variability in both magnitude and direction related to the three current components namely wind currents, tidal currents and wave currents. The circulation pattern rapidly changes with the change in the phase of the tide and local winds of land and sea breeze. The littoral currents directed up-coast during premonsoon and monsoon seasons have insignificant effect across the bay opening due to the sheltering effect of the sand bar. The study is helpful for understanding the geomorphological changes of the shoreline in this region. (Sinha-OEIS)
W74-04941

A STUDY ON MIXING AND CIRCULATION IN THE ST. LAWRENCE ESTUARY UP TO 1964,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
H. J. A. Neu.
AOL Report 1970-9, December 1970. 31 p, 21 fig, 7 ref.

Descriptors: *Estuaries, *St. Lawrence River, *Mixing, *Circulation, Salinity, Temperature, Ice.

The salinity and temperature distributions in the St. Lawrence Estuary during fresh water inflows in Feb. and in May of 1963 are reported and analyzed. The mixing character of the Estuary varied from being well mixed at the head to moderately mixed in the section below the head to Tadoussac. In the deep section below the mouth of the Saguenay River, stratified conditions prevailed. The water was appreciably fresher on the south side of the channel than on the north side except off the mouth of the Saguenay River. Progressing seaward, the depth of the fresh upper layer decreased along the north shore and increased along the south shore. Temperatures in the surface layer during Feb. were higher on the north side than on the south. In May, this trend was reversed. The primary motion in the system is a longitudinal two-layer circulation in which the surface layer deviates toward the south shore and the deep layer toward the north shore. There is a net seaward flow of lower-salinity water on the south side and a compensatory flow of higher-salinity water on the north side. The Gaspe Current is a high-velocity surface stream that forms below Tadoussac and grows seaward with the entrainment of the water from the rivers of the north shore. Upwelling of the deep warmer water to the surface maintains a nearly ice-free channel along the north shore through most of the ice season. The intensity of the estuarine circulation in the St. Lawrence Estuary is determined primarily by the quantity of fresh water entering the system. (Sinha-OEIS)
W74-04944

CAUSE AND PREDICTION OF BEACH EROSION,
National Weather Service, Garden City, N.Y. Eastern Region.
For primary bibliographic entry see Field 2J.
W74-04945

SELECTION AND DESIGN OF A BORE GENERATOR FOR THE HILO HARBOR TSUNAMI MODEL. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W74-04946

ESTUARY AND COASTLINE HYDRODYNAMICS.
Engineering Societies Monographs. McGraw-Hill Book Co., Inc., New York, 1966. 756 p. A. T. Ippen, editor.

Descriptors: *Estuaries, Coasts, *Hydrodynamics, *Beaches, *Shores, *Waves(Water), *Currents(Water), *Coastal engineering, Oceanography.

The fundamentals of water waves are logically and comprehensively developed to the point where practical problems become accessible to systematic interpretation by existing theory. The presentation is directed towards the needs of those working with coastal engineering problems. Limiting boundary conditions are emphasized while general mathematical developments are limited to those essential to understand the significance of the results. (See W74-04951 thru W74-04958) (Sinha-OEIS)
W74-04950

COASTAL PROCESSES,
California Univ., Berkeley. Dept. of Civil Engineering.
J. W. Johnson, and P. S. Eagleson.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc., Chap 9, p 404-492, 1966. 46 fig, 4 tab, 76 ref.

Descriptors: Coasts, *Beaches, Sediments, *Sediment transport, Beach erosion, Equilibrium, *Coastal structures, *Ocean currents, *Tidal effects, Wind, Rip currents, Profiles, Particle size, *Harbors, *Littoral, Breakwaters, Shore protection, Reviews.
Identifiers: Nearshore processes, Tidal currents, Longshore currents, Wave induced currents, Breaking waves, Sand by passing.

A review is presented of the state of knowledge of coastal processes. The review is presented under the following headings: sources and characteristics of beach material; modes of transport and losses of material; quantitative analysis of transport processes; characteristics of beach deposits; characteristics of the equilibrium beach; and sediment problems at coastal structures. (See also W74-04950) (Sinha - OEIS)
W74-04951

TIDAL DYNAMICS IN ESTUARIES. PART I: ESTUARIES OF RECTANGULAR SECTION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
A. T. Ippen.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 10, Part 1, p 493-522, 1966. 9 fig, 2 tab, 22 ref.

Descriptors: *Friction, *Sedimentation, Diffusion, *Tidal effects, *Estuaries, Coasts, Reviews.
Identifiers: *Cooscillating tides.

This review is limited to the development of understanding of those processes of tidal flows in estuaries which are of primary importance in dealing with diffusion and sedimentation problems. The subject is reviewed under the following headings: general review of engineering problems in tidal estuaries; general characteristics of estuaries; mathematic description of tides without friction and tides with friction; and experimental results on cooscillating tides. (See also W74-04950) (Sinha - OEIS)
W74-04952

TIDAL DYNAMICS IN ESTUARIES. PART II: REAL ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
D. R. F. Harleman.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 10, Part 2, p 522-545, 1966. 8 fig, 3 tab, 19 ref.

Descriptors: *Estuaries, *Friction, *Tidal effects, *Equations of motion, Coasts, Reviews.
Identifiers: Tidal wave propagation, *Cooscillating tides, *Harmonic analysis.

Analysis of tidal motion in real estuaries necessarily involves a degree of approximation, since it is never possible to specify boundary conditions by exact analytical expressions. For relatively narrow estuaries it is generally permissible to neglect the effect of the earth's rotation; however, it is rarely possible to ignore the effect of friction on tidal wave propagation in real estuaries. The subjects reviewed are physical concepts of tidal motion in estuaries; methods of analysis; numerical integration methods; harmonic method; damped cooscillating tide; and Delaware Estuary. (See also W74-04950) (Sinha - OEIS)
W74-04953

SALINITY INTRUSION IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
A. T. Ippen.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 13, p 598-629, 1966. 12 fig, 3 tab, 18 ref.

Descriptors: *Estuaries, *Salinity, *Tidal effects, Gravity, Fresh water, Mixing, Diffusion, *Coasts.
Identifiers: *Salinity intrusion, *Tidal prism.

The flow regime in estuaries is governed by four distinct dynamic influences, which determine the direction and magnitude of velocities at different elevations and at different distances from the mouth. The primary dynamic factors listed in order of their importance for the flow are as follows: (a) the effect of the tide throughout the salinity intrusion length as a function of the forcing tide at the entrance; (b) the effect of gravitational forces due to density variations between fresh water from upland sources and saline water entering from the sea; (c) the gravitational forces needed to produce a net seaward transport of fresh water; and (d) the Coriolis forces and centrifugal forces inducing transverse fluid motion due to rotation of the earth and due to the curvature of the estuary channel, respectively. (See also W74-04950) (Sinha - OEIS)
W74-04954

SEDIMENTATION IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
A. T. Ippen.
In: Estuary and Coastline Hydrodynamics, Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 15, p 648-672, 1966. 6 fig, 1 tab, 22 ref.

Descriptors: *Estuaries, *Sedimentation, *Sediment transport, *Diffusion, Shoals, Sediment load, Flocculation, Sands, Mud - water interface, Hydraulic transportation, Flow.

Following a review of the state of knowledge of factors related to estuarine sedimentation, summaries are presented of the properties of estuarine sediments; the interaction of sediment and water flow; and diffusion characteristics and sedimentation in real estuaries. Specific aspects considered are: general flow phenomena; bed load and its source; properties and sources of mud; shoaling; flocculation; transport of granular sediments; flow of water-mud mixtures; differences in hydraulic transport between granular and flocculating materials; and consequences of human activities. (See also W74-04950) (Sinha - OEIS)
W74-04955

FIELD EXPERIENCE IN ESTUARIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
H. B. Simmons.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 16, p 673-690, 1966.

Descriptors: *Estuaries, *Sediment transport, Dredging, Navigation channels, Tidal effects, Salinity, *Mixing, *Sedimentation, *Coasts, *Currents(Water).
Identifiers: Shoaling, *Tidal currents.

This review of field experience in estuaries discusses: tidal currents, their origin, effects of tidal range, effects of diurnal inequality in tides, and phase relationships between tide and currents; salinity generated currents; estuary mixing types; sedimentation in estuaries; sedimentation in navigation slips; and dredging and spoiling practices in estuaries. (See also W74-04950) (Sinha - OEIS)
W74-04956

MODEL LAWS FOR COASTAL AND ESTUARINE MODELS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
G. H. Keulegan.
In: Estuary and Coastline Hydrodynamics, Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 17, p 691-710, 1966. 11 ref.

Descriptors: *Estuaries, *Mixing, *Model studies, Density, Dimensional analysis, *Salinity, *Rivers, Flow, *Diffusion.
Identifiers: Similarity.

Model laws for coastal and estuarine models are reviewed. Subjects discussed are: dynamical approach to similarity; dimensional analysis for density flow; method of differential equations; necessity of distortion; models of unsalinated rivers; models of mixed estuaries; and mixed approaches to models. (See also W74-04950) (Sinha - OEIS)
W74-04957

TIDAL AND SALINITY MODEL PRACTICE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
H. B. Simmons.
In: Estuary and Coastline Hydrodynamics. Engineering Societies Monographs. McGraw-Hill Book Co., Inc. Chap 18, p 711-731, 1966. 12 fig.

Descriptors: *Estuaries, *Model studies, *Tides, *Salinity, Diffusion, Hurricanes, Storms, New Jersey, South Carolina, Louisiana, Texas, Rhode Island.
Identifiers: Absecon Inlet(NJ), Charleston Harbor(SC), Vermilion Bay(LA), Delaware Estuary, Matagorda Bay(TX), Narrogansett Bay(RI), *Salt water intrusion, Flushing.

What estuary models are like and what they can and cannot contribute to the solution of estuarine problemsis discussed, rather than the technical aspects of model construction, instrumentation, and operation. The hydraulic estuary model is an engineering and scientific tool which, in the hands of those well versed in its use and in the interpretation of model test data, can contribute greatly to the solution of complex problems. The hydraulic estuary model should not be looked upon as a substitute for field and analytical studies but rather as an aid in such studies by contributing information which cannot be obtained accurately by other means. As demonstrated by specific examples, hydraulic models of estuaries are extremely useful tools in studies leading to a more complete understanding of estuarine phenomena, as well as for predicting the effects of proposed physical and other changes in estuaries on the hydraulic, salinity, shoaling, and flushing characteristics of these complex systems. However, such model studies must still be classified as art rather than science, and for this reason estuary models should be entrusted to those who have experience in the field and are thoroughly familiar with the uses and limitations of the models involved. (See also W74-04950) (Sinha - OEIS)
W74-04958

CNOIDAL WAVES IN SHALLOW WATER,
Texas Univ., Austin. Dept. of Civil Engineering.
F. D. Masch.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 1, p 1-22, 1964. 7 fig, 25 ref.

Descriptors: *Shallow water, *Waves(Water), Energy.
Identifiers: *Cnoidal waves, *Wave transformations, Shoaling, Power transmission, Long waves.

The propagation of long waves of finite amplitude in water with depth to wavelength ratios less than about one-tenth and greater than about one-fiftieth can be described by cnoidal wave theory. To date little use has been made of the theory because of the difficulties involved in practical application. The theory necessary for predicting the transforming characteristics of long waves based on cnoidal theory is presented. Basically the method involves calculating the power transmission for a wave train in shallow water from cnoidal theory and equating this to the deep water power transmission assuming no reflections or loss of energy as the waves move into shoaling water. The equations for wave power have been programmed for the range of cnoidal waves, and the results are plotted in non-dimensional form. (Sinha - OEIS)
W74-04959

THE COASTLINE OF RIVER-DELTAS,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
W. T. J. N. P. Bakker, and T. Edelman.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 13, p 199-218, 1964. 10 fig, 1 tab, 4 ref.

Descriptors: Coasts, Mathematics, *Waves(Water), *Rivers, *Deltas, *Sediment transport, *Shallow water.
Identifiers: Coastal configuration.

The purpose is to investigate the shape of the coastline of a river delta on a coast, along which sediment is transported by waves only. In order to make the problem suitable to a mathematical treatment it is necessary to simplify to a large extent the processes occurring in nature. Instability along the circular part of the delta (all other parts are always stable) probably means, that 'spits' occur. The shape of spits is not dealt with. If the quantity of river sediment exceeds a certain amount, the delta becomes partly unstable and erosion on the lee side of the delta begins; the delta grows so large, that is acting as a partly circular 'groin' with erosion on its lee side and accretion on the weather side. (Sinha - OEIS)
W74-04961

THEORETICAL FORMS OF SHORELINES,
Rijkswaterstaat-Deltadienst, The Hague (Netherlands). Coastal Research Dept.
W. Grijm.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers. Chap 14, p 219-235, 1964. 13 fig.

Descriptors: *Shores, *Waves(Water), Bays, Coasts, *Sediment transport.
Identifiers: *Shoreline configuration, Littoral transport, Capes, Cusps, *Wave action, Nearshore.

Theoretical studies suggest that maximum littoral transport takes place when waves approach shore obliquely. Discussed is the question of the type of shoreline to be expected when the littoral transport is ruled by the function sin 2 alpha when alpha equals 45 degrees and alpha represents the angle between the wave front and the shoreline. Shoreline configuration is theoretically expected to vary as the angle of approach varies. Correspondence between configuration and angle of approach is illustrated. When littoral transport is at a maximum cusp formation takes place. (Sinha - OEIS)
W74-04962

QUASI-WEEKLY AND DAILY PROFILE CHANGES ON A DISTINCTIVE SAND BEACH,
Naval Postgraduate School, Monterey, Calif.
J. D. Rohrbough, J. E. Koehr, and W. C. Thompson.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 16, p 249-258, 1964. 4 fig, 9 ref.

Descriptors: *California, *Beaches, *Refraction(Water waves), Profiles, *Sediment transport, Intertidal areas, *Bays, Coasts, *Shallow water.
Identifiers: *Monterey Bay(Calif), Nearshore processes, Onshore-offshore transport, Daily variations.

Del Monte Beach, because of its sheltered location in Monterey Bay, California, provides a natural laboratory for the study of beach profile changes and other nearshore phenomena by virtue of the relative simplicity of the natural conditions that prevail there. Extreme wave refraction results in a prevalence of swell of low height and breaker angle, but having a wide range of period. Coastal currents, tidal currents, and meteorological tides are negligible. There is no significant net littoral drift, accordingly, changes in the beach profile appear to involve only onshore-offshore transport of sand grains. A breaker-height gradient occurs along the beach, so that two beach profiles were established. Gradients also occur along the beach in sand texture, beach slope, and beach curvature. The two profiles, restricted to the intertidal zone, were measured quasi-weekly and then daily over a period of nine months. The changes in sand level at both were quite similar in magnitude in spite of the wave height gradient along the beach. No clear-cut seasonal cycle and no fortnightly spring-neap tidal cycle was detected in the data. The concurrent nature of the daily variations of both sand level and waves recorded immediately off the beach leave no doubt that changing wave conditions were the primary cause of the changes observed in Del Monte Beach, even though no clear-cut relationship between the two factors was apparent. (Sinha - OEIS)
W74-04964

NUMERICAL PREDICTION ON TYPHOON TIDE IN TOKYO BAY,
Central Research Inst. of Electric Power Industry, Tokyo (Japan).
T. Ito, M. Hino, J. Watanabe, and K. Hino.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 43, p 686-712, 1964. 15 fig, 9 ref.

Descriptors: Hurricanes, *Typhoons, *Storm surges, *Dikes, *Tides, *Forecasting, *Bays, Coasts, Equations, Winds, Coastal structures.
Identifiers: *Japan(Tokyo Bay), Prediction.

Mathematical problems on the numerical calculation of storm surges are discussed. The partial differential equations of motion adopted take into account the Coriolis force and the non-linear terms such as the inertial terms and a quadratic form of bottom friction. As a result, special care must be taken in order to obtain stable forms of finite-difference equations. Inadequate forms accumulate errors to cause divergence of the step by step calculations. A set of stable forms of the finite-difference equations of motion and continuity has been derived. Japan coasts are frequently damaged by severe storm surges (Typhoon Tides). To protect the metropolitan area from storm surges, a proposal has been made to construct a dike across Tokyo Bay. A numerical calculation has been made by means of IBM 7090 to estimate for several opening widths of the proposed dike, its effects on the reduction of surges. Interactions between daily tides (astronomical tide) and surges are also discussed. (Sinha-OEIS)
W74-04971

POTENTIALS OF TIDAL POWER ON THE NORTH ATLANTIC COAST IN CANADA AND UNITED STATES,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
J. T. Laba.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 49, p 832-857, 1964. 10 fig, 5 tab, 2 ref.

Descriptors: Canada, United States, Tides, *Powerplants, *Bays, Coasts, *Tidal powerplants, Tidal energy, Maine, *International waters.
Identifiers: *Power sources, Passamaquoddy Bay, New Brunswick(Canada), Shepody Bay, Cobscook Bay(ME).

The most suitable locations for erection of tidal power plants on the North Atlantic Coast are reviewed and classified in respect to the possible pool arrangement. The harnessing of the tides to produce power in various layouts is described. The output from two proposed tidal power projects, Passamaquoddy Bay and Shepody Bay are compared and some auxiliary power sources to supplement the varying output of tidal power are discussed. The tide producing forces and the effect of the coastline on the tide height is also briefly described. (Sinha-OEIS)
W74-04972

APPLICATION OF BOUNDARY-LAYER THEORY TO DISPERSION IN NON-STRATIFIED TWO-DIMENSIONAL ESTUARIES,
Nielsen Engineering and Research, Inc., Mountain View, Calif.
J. N. Nielsen, and G. D. Kuhn.
Available from the National Technical Information Service as PB-228 852, $9.25 in paper copy, $1.45 in microfiche. Technical Report NEAR TR 45, (1973). 117 p, 17 fig, 3 tab, 17 ref, 1 append. OWRR C-3189(No 3698) (1). 14-31-0001-3698.

Descriptors: *Estuaries, *Dispersion, *Turbulent boundary layers, Mixing, Stratification, Flow, *Water pollution sources, Momentum equation, Fluid friction, Open channel flow, Convection, *Diffusion, *Path of pollutants.

An analytical formula representing the law of the wall and the law of the wake of turbulent boundary-layer theory has been found to represent the vertical velocity profiles of both laboratory channels and field data from real estuaries. The formula is used in an integral boundary-layer calculation method to calculate the detailed time-dependent flow field of two-dimensional estuaries. For given tidal information, only the integrated continuity and momentum equations are necessary to calculate the two parameters of the formula. The unique solution is found to pass through one or more singular points between the ends of the estuary. An analytical expression for the concentration profile is derived based on an analogy between turbulent exchange of momentum and mass. Good comparisons between theory and experiment were obtained for the flow field of a laboratory flume. Examination of data for dispersion indicates that the dominant terms of the governing equations are not diffusive in nature but are convective.
W74-04983

STATUS OF STATE COASTAL ZONE MANAGEMENT EFFORTS.
National Oceanic and Atmospheric Administration, Washington, D.C. Coastal Zone Management Task Force.
Preprint. May, 1973. 62p.

Descriptors: *Coasts, *State governments, Planning, Administration, *Regulation, *Legislation, *Management, Mapping.
Identifiers: *Coastal zone management.

A series of resumes is presented, each of which briefly summarize the present (1973) status of activities in the coastal zone by individual state governments. Information was compiled on (1) administrative structures set up to focus state efforts on coastal zonal problems; (2) legislation, executive orders, and resolutions dealing with coastal activities; and (3) research, inventory, mapping, and management efforts. (Hoffman-North Carolina)
W74-04995

LONGSHORE CURRENTS AND SEDIMENT MOTION IN THE COASTAL ZONE OF THE SEA OF AZOV,
Rostov-on-Don State Univ. (USSR).
V. A. Mamykina.
Fluid Mechanics--Soviet Research, Vol 2, No 5, p 166-170, September-October 1973. 2 fig, 3 ref. (Originally published in Gidromekhanika, No 18, p 42-46, 1972.)

Descriptors: *Currents(Water), *Sediment transport, *Deposition(Sediments), *Coasts, Shores, Sand spits, Sand bars, Waves(Water), Water circulation, Movement, Velocity, Winds, Slopes.
Identifiers: *USSR(Sea of Azov), *Longshore currents.

Longshore currents near Belosarayskaya sandspit on the northern shore of the Sea of Azov were investigated in July-August 1966-67 for their effects on sediment transport. Currents in the intermediate layer are most stable and depend little on changes in wind and bottom relief. Bottom-layer currents play an important role in erosion and sediment deposition in the coastal zone. Currents in the Belosarayskaya Bay are characterized by their low velocity--2 to 5 cm/sec. The tip of the bar (1 m from the surface, 2 m station depth, and 500 m from the water edge) is characterized by an extremely complex circulation. Sediment deposition results in the formation of underwater extensions of the bar which in time reach the surface. Prevailing bottom current velocity along the seacoast of the bar is 6-8 cm/sec at a distance of 300-500 m and 8-11 cm/sec at 1,000 m from shore, corresponding to wind speeds of 3-4 m/sec. With wind speeds of 5 m/sec or more, a current velocity of 17-20 cm/sec was observed. Maximum bottom current velocities of 30-32 cm/sec were noted after 8-12 m/sec storm squalls. Bottom deposits on the underwater slope of the Belosaraysk bar are composed of fine-grained sand (80%), whose movement begins with velocities of 8-11 cm/sec. At current velocities of 15-20 cm/sec, corresponding to yearly average wind speeds of 5 m/sec above the Sea of Azov, the transported material includes silt particles and fine- and medium-grade sand. Bottom velocities of 30-40 cm/sec suffice for transport of sediment of all fractions found on the coast and bottom of the Sea of Azov. (Josefson-USGS)
W74-05024

VARIATIONS IN THE HEIGHT OF WAVE RUN-UP ON A SANDY BEACH,
Akademiya Nauk URSR, Kiev. Inst. of Hydromechanics.
E. S. Tsaits, and V. V. Khomitskiy.
Fluid Mechanics--Soviet Research, Vol 2, No 5, p 152-156, September-October 1973. 2 fig, 2 tab, 8 ref. (Originally published in Gidromekhanika, No 18, p 31-35, 1971).

Descriptors: *Waves(Water), *Beaches, *Sands, Height, *Variability, Wavelengths, Slopes, Measurement, Equations.
Identifiers: *USSR(Crimea), *Wave runup.

Measurements were made of wave runup height in the western part of the Crimea on a beach composed of medium- to coarse-grained sand containing rolled shell fragments. A stretch of straight beach was selected as the observation site. Periodic measurements and leveling operations were performed during calm periods on each leveling line to assess the state of the coastal slope and beach between storms. Pickups of the marine wave gage (GM-16) were fastened to piles and connected via cables to the EPP-09 potentiometer to measure wind-wave height at various points along the underwater slope. The first recording of waves approaching from the sea was made at a depth of 7-8 m, 350-400 m from shore; the second was made at a depth of 4-5 m, 200-250 m from shore. The height of wave runup was fixed visually from a reading on a decimeter tape laid out on the surface of the beach for each of the 100-150 waves and recorded in a logbook. A total of 17 storm seconds were processed. Wave height of 1% expectation was 0.35-1.8 m; average wavelength was 10-41 m; and the angle of approach was 4-65 deg. The coefficient of variation of wave runup height ranged from 0.18 to 0.4. Formulas are given for estimation of wave height on flat slopes. (Josefson-USGS)

W74-05025

MOVEMENT OF WATER ALONG THE SHORE AND NORMAL TO IT IN THE NEAR-SHORE ZONE OF A SHALLOW-WATER COAST,
Akademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.
A. I. Filimonov.
Oceanology, Vol 6, No 4, p 530-534, 1966. Trans. from Okeanologiya, Vol. 5, No. 3, 1965. 1 fig, 3 tab, 5 ref.

Descriptors: *Currents(Water), Topography, *Sediment transport, *Shallow water, Coasts, *Storms, *Winds, Beaches, Slopes.
Identifiers: *Longshore currents, Nearshore processes, *Water transport asymmetry.

From an evaluation of experimental studies of storm-generated movements of water made with recording current meters, it has been possible to trace the distribution of near-bottom velocities in the longshore movement on the profile of the submarine beach slope and to consider movements parallel to and normal to the shore in their interaction. The stretch of coast examined in 1963 had two submarine ridges, whereas in the summer of 1962 there were three ridges on the same stretch. This indicates considerable reconstruction of the profile of the submarine beach slope. Alternating movements of water normal to the shore take place against a background of prevailing longshore flow. The amount of water transported by the longshore flow is 60-80% of the discharge through a section perpendicular to the total current vector, and the magnitude of this transport is related to the wind direction relative to the shoreline. There is a fairly marked asymmetry of water discharge in the bottom longshore flow. The return flow ranges between 1 and 17%. The asymmetry of water transport is less pronounced in bottom flow to the shore, and the ratio may be unity. (Sinha-OEIS)
W74-05028

COMPOSITE ENERGY FLUXES AS FACTORS IN COASTAL FORMATION,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
I. A. Pravotorov.
Oceanology, Vol 5, No 3, p 66-68, May 1966. 12 ref. Trans. from Okeanologiya, Vol. 5, Nol 3, 1965.

Descriptors: *Waves(Water), *Currents(Water), Shores, Winds, Meteorology, Hydrology, Topography, *Eddies, *Storms, *Energy, *Shallow water.
Identifiers: Beach cusps, Scalloping, Bottom topography, Nearshore processes, *Longshore currents.

A number of phenomena taking place in the nearshore zone are not satisfactorily explained purely in terms of wave processes and the currents associated with them, or in terms of the currents accompanying surges. Among these phenomena are the wave-associated 'rhythmic' medium scale formations. Beach cusps are evidently another formation whose 'rhythmic' inception is not readily explainable by the effect of the energy flux of waves alone. The 'rhythmic' windings of the isobaths in a zone of ridges on the submarine slope of accumulation features in the form of 'harmonics' of various scales is reminiscent of similar phenomena occurring below water. Scalloping is also a feature of hydrological fronts in the presence of wind, whereas waves approaching the front are greatly attenuated, and at the front break and are destroyed. Many phenomena observed in the nearshore zone are not solely due to wave action. The formation of sand ridges and ridges of algae at an angle to the coast is reminiscent of the action of Langmuir eddies generated by the wind and, it must be supposed, interacting with the waves as they are destroyed on approaching the shore. When eddies which have developed over deep water areas during an intense storm enter shallower water they begin to affect the sea floor. Smaller eddies induced by the larger eddies and maintained by wind energy continue to advance towards the shore until they are completely destroyed in interaction with the bottom and with the waves; this affects the material-moving capacity of the waves and is reflected in coastal dynamics. (Sinha-OEIS)
W74-05029

ANNOTATED BIBLIOGRAPHY ON EFFECTS OF SALINITY AND SALINITY CHANGES ON LIFE IN COASTAL WATERS,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 2J.
W74-05031

HYDROGRAPHIC ATLAS OF NORTH CAROLINA ESTUARINE AND SOUND WATERS, 1972,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
For primary bibliographic entry see Field 2J.
W74-05032

NONLINEAR DEVELOPMENT OF THE RAYLEIGH-TAYLOR INSTABILITY IN THE 'SHALLOW-WATER' APPROXIMATION,
Naval Research Lab., Washington, D.C.
D. L. Book, E. Ott, and A. L. Sulton.
Available from NTIS as AD-768 296, $2.75 in paper copy. NRL Memorandum Report 2642, September 1973. 17 p, 4 fig, 12 ref.

Descriptors: *Shallow water, Gravity, *Interfaces, Fluid mechanics, Dynamics.
Identifiers: Riabouchinsky formulation, Gas-dynamic analogy, Rayleigh-Taylor instability, Fluid layers.

The nonlinear evolution of the Rayleigh-Taylor instability in the long wavelength limit is investigated for an incompressible fluid supported against gravity (or inertial forces) by a massless fluid and bounded above by a rigid wall. In plane geometry, the equations are identical with those of shallow water theory, but with the sign of the gravitational acceleration reversed. They are rewritten in the Riabouchinsky (gas-dynamic analogy) formulation and solved numerically. The shallow water approximation permits a solution for the motion of the interface without reference to the detailed motion of fluid in the interior. There is a range of parameters in which the nonlinear development of the Rayleigh-Taylor instability in an ideal fluid can be simply described in terms of the motion of the interface, that is, essentially one-dimensionally. The resulting equations have been solved numerically to yield a universal functional form of this motion. The time over which this solution can be expected to hold depends on the parameters with which it is scaled. The solution found here is only valid until vertical displacements become of the order of the wavelength. Thereafter the flow is essentially two-dimensional and the shallow water description is not applicable. The results given will be useful in liner stability analyses, however, if the fastest growing wavelength observed experimentally is of the order of or larger than the the minimum radius the liner is designed to reach, or if the growth rates are such that the 'dwell time' of the liner is comparable to that required to reach the breakdown point of the model. (Sinha - OEIS)
W74-05034

AN EVALUATION OF THE EFFECTS OF ESTUARINE ENGINEERING PROJECTS,
Texas Parks and Wildlife Dept. Austin.
For primary bibliographic entry see Field 5B.
W74-05038

WAVE PROPAGATION IN CONTINUOUS RANDOM MEDIA,
California Univ., Los Angeles. Dept. of Mathematics.
For primary bibliographic entry see Field 2J.
W74-05041

EXISTING AERIAL PHOTOGRAPHIC RESOURCES OF COASTAL GEORGIA AND A BRIEF LISTING OF INTERPRETATIVE AIDS,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 2J.
W74-05042

NUTRIENT STUDIES IN HYPERFERTILIZED ESTUARINE ECOSYSTEMS. I. PHOSPHORUS STUDIES,
Gulf Coast Research Lab., Ocean Springs, Miss.
For primary bibliographic entry see Field 5C.
W74-05061

THE OXYGEN UPTAKE DEMAND OF RESUSPENDED BOTTOM SEDIMENTS.
Seattle Univ., Wash. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W74-05114

THE HYDROGRAPHY OF THE BROADKILL RIVER ESTUARY, DELAWARE,
Delaware Univ., Newark. Dept. of Biological Sciences.
P. Dewitt, and F. C. Daiber.
Chesapeake Science, Vol 14, No 1, p 28-40, March 1973. 9 fig, 1 tab, 13 ref. OWRR A-006-DEL(4).

Descriptors: *Estuaries, *Delaware, *Water circulation, Water quality, Water pollution, Saline water intrusion, Dissolved oxygen, Tides, Turbidity, Mixing, Hydrography.
Identifiers: *Broadkill River(Del).

The hydrography of the Broadkill River, a narrow, shallow estuary in southeastern Delaware, was studied from July 1966 through February 1971. Measurements of current velocity, tide stage, salinity, water temperature, dissolved oxygen, pH, and turbidity were made at several stations along the course of the estuary. The Broadkill River has characteristics of both a partially-mixed and well-mixed estuary. During normal runoff the system discharges 130,000 cu m of freshwater per tidal cycle. The flushing time of the entire system increases from 10.3 tidal cycles during high runoff to 24.2 tidal cycles during low runoff. The lower estuary, the most seaward 25% of the system, is sectionally homogeneous during 90% of each tidal cycle. Homogeneity is maintained by strong tidal currents. The flushing time of the lower estuary is relatively constant and increases from 0.6 to 0.9 tidal cycle with decreasing freshwater runoff. The tidal river, the farthest upstream 40% of the system, is rarely invaded by saline water from the upper estuary. This section is polluted through the discharge of organic wastes into the river at a point 0.5 km downstream from the river's source. Downstream from the source of pollution, anoxic conditions are present from spring through autumn and are relieved only during the coldest months of the winter. (Knapp-USGS)
W74-05122

ON THE POSITION OF TIDAL BARRIERS IN NORTHUMBERLAND STRAIT,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2E.
W74-05140

RHODE ISLAND'S BARRIER BEACHES: VOLUME I, A REPORT ON A MANAGEMENT

PROBLEM AND AN EVALUATION OF OPTIONS,
Rhode Island Univ., Kingston. Coastal Resources Center.
S. B. Olsen, and M. J. Grant.
Marine Technical Report No 4, 1973. 118 p, 3 fig, 19 ref, 3 append.

Descriptors: *Barrier islands, *Beaches, *Water resources development, *Rhode Island, Management, Reviews, Evaluation, Recreation facilities, Erosion control, Beach erosion, Hurricanes, Shore protection, Ocean waves, Environmental effects, Marshes, Ecology, Social aspects.
Identifiers: *Barrier beaches.

Information is summarized and evaluated on management problems of the barrier beaches along Rhode Island's ocean coast. A barrier beach is a narrow strip of land made of unconsolidated material that extends roughly parallel to the general coastal trend and is separated from the mainland by a relatively narrow body of water. In the great majority of cases Rhode Island barriers are the seaward boundaries of coastal ponds, many of which are salt or brackish. The barriers have been formed by longshore currents and waves that have deposited sediments, chiefly sand and pebbles, across shallow embayments. The barriers are low in profile and are highly vulnerable to hurricane damage. (Woodard-USGS)
W74-05152

PHOSPHATES IN SEDIMENTS OF PAMLICO ESTUARY,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W74-05296

MODEL FOR COLIFORM BACTERIA IN GRAND TRAVERSE BAY,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-05328

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES--FIRST ANNUAL PROGRESS REPORT,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W74-05332

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

ECONOMIC ASPECTS OF A NUCLEAR DESALINATION AGRO-INDUSTRIAL PROJECT IN THE UNITED ARAB REPUBLIC,
New York State Coll. of Agricultural and Life Sciences, Ithaca. Dept. of Agricultural Economics.
D. Chapman.
American Journal of Agricultural Economics, Vol 55, No 3, p 433-440, August 1973. 6 tab, 24 ref, 1 append.

Descriptors: *Financial feasibility, *Cost-benefit analysis, *Irrigation programs, *Desalination, *National income, *Investment, Operating cost, Governments, Systems analysis, Optimization.
Identifiers: *Agro-industrial projects, *Social benefits, *United Arab Republic(El-Hamman-Egypt).

In recent years, the possibility of desalting sea water to produce irrigation water for large-scale commercial agriculture and industry has been considered as a means of stimulating cooperation and economic development in the Middle East. This study investigates the financial feasibility and the social benefits and costs of nuclear desalination agro-industrial projects. Financial feasibility and national income benefit analyses are performed. The financial analysis determines project investment and operating costs, revenues, cash flows, and profitability with likely market prices and government policies. The benefit-cost analysis examines the effect of the project on macroeconomic goals such as employment, foreign trade, capital scarcity, and national income. The project site is El-Hamman, 30 miles west of Alexandria and chosen because of its soil characteristics, present unsettles status, and nearness to market and port facilities. Project design was carried out in three simultaneous phases: selection of agricultural and livstock commodities for maximum profit from use of project water; examination for maximum profit of industries having electric-intensive production processes; and engineering examination of 500-megawatt electric power plants operated in association with desalination plants to determine least costly methods of production. As presently designed, such a complex appears to require deficit financing, provide little employment, retard national income growth compared to other investment opportunities, and increase the foreign exchange deficit. (Bell-Cornell)
W74-05382

3B. Water Yield Improvement

PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART 2. SOUTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 6D.
W74-04915

WATER-RESOURCES APPRAISAL OF THE BIG SANDY AREA, MOHAVE COUNTY, ARIZONA,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 4B.
W74-04922

GROUND-WATER RESOURCES OF THE SAN ANTONIO AREA, TEXAS: A PROGRESS REPORT ON STUDIES, 1960-1964,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-04992

GROUNDWATER RESOURCES OF THE VALE OF CLWYD.
Water Resources Board of England and Wales.
For primary bibliographic entry see Field 4B.
W74-05168

WHEAT PRODUCTION PROBLEMS AND POTENTIALS ON DRYLANDS,
Wheat Research and Training Center, Ankara (Turkey).
For primary bibliographic entry see Field 3F.
W74-05221

3C. Use Of Water Of Impaired Quality

AN ANALYSIS OF THE WATER QUALITY PROBLEMS OF THE SAFFORD VALLEY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W74-04976

EXPERIMENT IN RAPID LEACHING OF SALINE SOILS IN THE GOLODNAYA STEPPE (OPYT USKORENNOY PROMYVKI ZASOLENNYKH POCHV GOLODNOY STEPI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
A. A. Sid'ko, S. I. Myasishchev, V. P. Bayakina, and V. A. Sveshnikov.
Pochvovedeniye, No 12, p 133-137, 1972. 4 tab.

Descriptors: *Land reclamation, *Drainage practices, *Leaching, *Saline soils, *Drains, Salts, Water balance, Evaporation, Permeability, Rice.
Identifiers: *USSR(Golodnaya Steppe).

Experiments in rice paddies showed that strongly saline soils can be desalinized in a single season by using deep permanent drains and closely spaced shallow temporary drains. Investigations were conducted on Meadow-Sierozem soil in the Golodnaya Steppe where total toxic salt content of the soil ranged from 0.5% in the upper layer of the zone of aeration to 2.5% in the lower layer, and permeability in these layers ranged from 0.5 m/day to 0.03 m/day, respectively. Deep permanent drains spaced 330 m apart and shallow temporary drains spaced 20 m apart desalinized the soil to a depth of 120-130 cm within 72 days using 5,000 cu m of water/ha and to a depth of 150 cm within 112 days using 8,300 cu m of water/ha. Under the same conditions but with more frequent application of deep drains during this time, the soil was desalinized to a depth of 4.5 m. (Josefson USGS)
W74-05018

POSSIBILITIES OF SUPPLY AND PROPER USE OF WATER IN THE GARMSAR AREA,
Ministry of Water and Power, Tehran (Iran). Research Div.
B. Yazdani.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 212-224. 12 tab.

Descriptors: *Irrigation, *Dry farming, *Agriculture, Arid lands, Cereal crops, Soils, Irrigation systems, Irrigation canals, Irrigation design, Irrigation programs, Irrigation wells, Groundwater, Groundwater recharge, Groundwater resources, Water resources, Water resources development, Water supply development.
Identifiers: *Iran(Garmsar area).

The garmsar area of Iran is an arid zone of approximately 50,000 hectares on the edge of the great salt desert of central Iran. A very dry climate prevails in the area, offering insufficient water to irrigate all the arable lands. High temperatures and soil-drying winds characterize the climate. The Hablehrud River and its tributaries are the principal source of agricultural water in the region with an annual flow of 247.7 mcm. which is fairly saline. Groundwater extraction offers only an additional 35 mcm. of similarly saline water. These water quality conditions contribute to the cause of the salty and calciferous soil of the region. Current irrigation development includes a canal system of about 920 km total which diverts the flow of the Hablehrud. This system irrigates barley and wheat primarily, but some cotton is also cultivated. The regional development plan includes increased use of groundwater, saline soil reclamation, additional surface water development and recharge augmentation. These steps are expected to greatly improve the agricultural productivity of Garmsar. (Muller-Arizona)
W74-05217

GENERAL REPORT ON DEVELOPMENT AND UTILIZATION OF SALINE SOILS IN IRAN,
Jondi Shahpour Univ., Ahvaz (Iran).
A. Ghobadian, and H. Siadat.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972. p 248-257. 1 tab.

escriptors: *Dry farming, *Agriculture, *Saline oils, *Soil chemistry, Salinity, Chemical proper-es, Geochemistry, Geology, Leachate, Soil emical properties, Soil environment, Soil anagement, Saline water, Saline water systems, oil-water-plant relationships, Land, Arable land. lentifiers: *Iran.

ver 90 percent of Iran receives less than 500 mm precipitation annually. Peculiarities in omorphology and land degradation have led to e development of saline soils in the region. The tural processes of salinization of soils are scussed, including geology and geochemical fac-rs, wind effects, geomorphology, biological fac-rs, and surface water effects. The high salinity surface waters is determined to be a significant ctor in soil salination during periods of extensive nual flooding. Manmade or secondary saliniza-on is also found to be a significant factor, usually king the form of irrigation and soil mismanage-ent. A decrement in groundwater quality is also oted. The application of saline groundwater in ir-gation enhances soil salination. These saline soils fer crop yields under the optimum production vels. Salination effect studies are proposed as e studies in salt-tolerant crop breeding. Salinity ntrol measures are proposed, including land ainage, irrigation management, and leaching. armer awareness of both salinity problems and ntrol methods is emphasized. (Muller-Arizona) 74-05218

HE POSSIBILITY OF SODA FORMATION IN OIL BY BIOCHEMICAL MEANS, (IN RUS-IAN),
or primary bibliographic entry see Field 2G.
74-05271

XPERIENCE OF MEADOW SOIL DESALINA-ION IN MURGAB OASIS (IN RUSSIAN),
. Sheripov.
robl Osvoeniya Pustyn'. 2. p 53-57, 1972, English mmary.
lentifiers: Chlorides, Magnesium, Meadow, asis, Sodium sulfide, *Soil desalination, USSR(Murgab Oasis), *Salts, *Saline soils, Soil aching.

tilization of closed horizontal drainage caused a harp change in soil salt regime in the irrigated eas. In lowlands the danger of salt accumulation curs towards the autumn at the backwater in the llector. When reclaiming the heavy saline fallow nds, very intensive leaching of sodium chloride observed. The amounts of sodium sulfide and g decrease by 2-2.5 times.--Copyright 1973, iological Abstracts, Inc.
74-05368

D. Conservation In Domestic and Municipal Use

NVIRONMENTAL GEOLOGY AND YDROLOGY, MADISON COUNTY, LABAMA: WATER RESOURCES,
eological Survey, University, Ala. Water esources Div.
or primary bibliographic entry see Field 4B.
74-04911

'ATER RESOURCES AS A BASIS FOR COM-REHENSIVE PLANNING AND DEVELOP-ENT IN THE CHRISTINA RIVER BASIN,
elaware Univ., Newark. Water Resources enter.
or primary bibliographic entry see Field 6B.
74-04988

ETAILED PROJECT REPORT, DYERSBURG, ENNESSEE, FINLEY STREET AREA.
rmy Engineer District, Memphis, Tenn.
or primary bibliographic entry see Field 4A.
W74-04989

PRATTVILLE, ALABAMA, COMMUNITY DEVELOPMENT PLAN, VOLUME I: TEXT.
Central Alabama Regional Planning and Development Commission, Montgomery.
For primary bibliographic entry see Field 6B.
W74-04991

A SUMMARY REPORT ON THE STUDY OF LAND AND WATER RESOURCES IN NORTHEAST GREENWICH, CONNECTICUT.
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 4D.
W74-04996

METHODS OF REDUCING POWER CONSUMPTION IN PUMPING WATER IN WATER SUPPLY SYSTEMS, INCLUDING THE USE OF BOOSTER STATIONS,
Moskovskii Inzhenerno-Stroitelnyi Institut (USSR).
For primary bibliographic entry see Field 8C.
W74-05093

WATER RESOURCES OUTLOOK FOR THE MINNEAPOLIS-SAINT PAUL METROPOLITAN AREA, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4B.
W74-05172

3E. Conservation In Industry

WATER AND THE ENERGY CRISIS,
Bureau of Reclamation, Washington, D.C. Div. of Water and Land.
For primary bibliographic entry see Field 6D.
W74-04912

THE CHALLENGE OF ENVIRONMENTAL PROTECTION AND INDUSTRIAL DEVELOPMENT,
National Water Well Association, Houston, Tec. Research Facility.
For primary bibliographic entry see Field 6G.
W74-05083

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME I. COPPER, ZINC, AND LEAD INDUSTRIES,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5D.
W74-05116

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME II. ALUMINUM, MERCURY, GOLD, SILVER, MOLYBDENUM, AND TUNGSTEN,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5D.
W74-05117

EFFECTS OF WASTE WATER RECYCLE IN A PAPERBOARD MILL,
Green Bay Packaging, Inc., Wis.
For primary bibliographic entry see Field 5D.
W74-05254

EFFLUENT-FREE BLEACHED KRAFT PULP MILL: PRESENT STATE OF DEVELOPMENT,
Toronto Univ. (Ontario). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W74-05275

CLOSED WATER CIRCULATION SYSTEM IN A PAPER AND PAPERBOARD MILL (GESCHLOSSENER WASSERKREISLAUF IN EINER PAPIER-UND KARTONFABRIK),
Papier- und Kartonfabrik Ofteringen (West Germany).
For primary bibliographic entry see Field 5D.
W74-05281

FUNDAMENTAL VIEW OF THE CLOSED WATER CIRCUIT (DER GESCHLOSSENE WASSERKREISLAUF IN GRUNDSAETZLICHER BETRACHTUNG),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
For primary bibliographic entry see Field 5D.
W74-05282

A PULP AND PAPER MILL WITH FULLY CLOSED RECIRCULATION SYSTEM -- UTOPIA OR REALISTIC POSSIBILITY. (EINE ZELLSTOFF-UND PAPIERFABRIK MIT VOLLSTAENDIG GESCHLOSSENEM KREISLAUF -- EINE UTOPIE ODER EINE REALISTISCHE MOEGLICHKEIT),
Karlstads Mekaniska Werkstad A.B. (Sweden).
For primary bibliographic entry see Field 5D.
W74-05289

3F. Conservation In Agriculture

PLANNING FOR THE ULTIMATE HYDRAULIC DEVELOPMENT OF THE NILE VALLEY,
For primary bibliographic entry see Field 4A.
W74-04997

THE ZUIDERZEE WORKS WITHIN THE FRAME OF PHYSICAL PLANNING,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05001

AGRICULTURAL ASPECTS,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05002

INFLUENCE OF WATER REGIME ON THE INDIRECT ABSORPTION OF RADIOCESIUM, RADIOSTRONTIUM, AND RADIOCOBALT BY LOWLAND RICE,
European Atomic Energy Community, Ispra (Italy). Biology Div.
For primary bibliographic entry see Field 5B.
W74-05199

THE SOILS OF THE URAL RIVER ZONE IN THE GUREV REGION AND THEIR IMPROVEMENTS DURING IRRIGATION, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Pochvovedeniya.
For primary bibliographic entry see Field 2G.
W74-05205

COTTON: A COMPUTER SIMULATION OF COTTON GROWTH,
Agricultural Research Service, Tucson, Ariz. Cotton Production Research Unit.
H. N. Stapleton, D. R. Buxton, F. L. Watson, D. J. Nolting, and D. N. Baker.
Arizona Agricultural Experiment Station, Tucson, Technical Bulletin 206. 1973, 124 p. 44 fig, 1 tab, 38 refs.

Descriptors: *Cotton, *Plant growth, Model studies, *Computer models, *Simulation analysis, Field crops, Fiber crops, Agriculture, Germina-

tion, Crop production, Growth rates, Growth stages, Height, Productivity, Soil-water-plant relationships, Climatic data, Testing, Productivity, Crops, Cultivation.

The cotton production system is defined by a multi-component flow-chart model. The principal component of the system is the actual cotton plant. A digital computer simulation of a cotton plant is developed. This model uses hourly input data of air temperature, water vapor pressure gradient, incident short wave radiation, carbon dioxide concentration, soil moisture tension, soil temperature, soil impedance to elongation of the hypocotyl, sun altitude and acute angle between sun azimuth and cotton rows to generate hourly water content weight percentage in the seed during the preemergence growth stage and to generate hypocotyl length, change in hypocotyl length, percent of seed that have emerged and percent of seed energy that has been expended during the post emergence growth stage. This model is validated with actual data. Five appendices are included which deal with model input estimation, program variable identification, program use, sample input and output and field monitoring techniques. (Muller-Arizona)
W74-05213

VEGETATION OF CENTRAL ANATOLIA AND ITS ECOLOGY,
Ankrana Univ. (Turkey). Dept. of Botany.
For primary bibliographic entry see Field 4A.
W74-05214

THE SUMMER FALLOW SYSTEM,
Oregon State Univ., Corvallis.
T. G. Zinn.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 91-108. 6 fig, 6 tab.

Descriptors: *Agriculture, *Dry farming, *Arid lands, *Fallowing, Rotations, Soil management, Crop production, Farm management Soil moisture, Soil water, Water conservation, Water storage, Cereal crops, Field crops, Forages, Mulching, Rain, Rainfall, Water sources, Soils, Semiarid climates, Cultivated lands.
Identifiers: *Turkey.

While rainfall is too limited to permit annual cropping in many arid and semi-arid areas, such regions including parts of Turkey and the United States, do lend themselves to both partial year cropping and fallow. Such a procedure was found to give a higher total production than annual cropping for winter wheat. The primary purpose of the fallow system is to accumulate moisture in the soil root zone area during no-production periods for the crop to consume during growing periods. The maximum accumulation will occur when proper weed control reduces unwanted evapotranspiration, when the soil has a high infiltration rate to incident rainfall, when the surface of the field is sloped such that surface movement of water is sufficiently slow for proper infiltration, when irregular tillage is avoided which increases soil evaporation surfaces and when a moisture barrier such as mulch is introduced to store accumulated moisture. Such fallow procedures are found optimal in the summer months during which only about 25 percent of the annual rain falls. Summaries are presented for the testing of 80 different treatment combinations over a two-year experimentation period for a study area in Turkey. These studies offer the additional conclusion that treatment timing is important in the fallow process and that mechanization is necessary for the proper timing to be realized. (Muller-Arizona)
W74-05215

AGRICULTURAL ASPECTS OF ARID AND SEMI-ARID ZONES,
Soils Inst., Tehran (Iran).
A. F. Mahdavi.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 52-60.

Descriptors: *Agriculture, *Dry farming, *Arid lands, *Land development, Arable land, Crops, Cultivated lands, Arid climates, Land classification, Land resources, Semiarid climates, Soils, Land use, Ranges, Pastures, Irrigation, Irrigation efficiency, Irrigation programs, Irrigation water.
Identifiers: *Iran.

Seventy-three percent of Iran is arid or semi-arid land, and much of the remainder is mountainous. If Iran is to keep pace with its rapidly growing population, it must expand its agriculture. In attempting is determine the optimal land usage, maps classifying land resources with respect to agriculture (both dry land and irrigated), range, forests and recreation were constructed. Development is planned in light of the recommendations of these surveys. Irrigation and drainage techniques, field leveling and grading, crop water demand, and soil fertility-irrigation interaction are additional technological considerations in the planning process. Four areas of research offer Iran improvements in agricultural yield. Dryland farming, saline soil reclamation, use of water of impaired quality and fertilization are being explored for this purpose. The overall priorities of national research coordination, support of research institutions, integration of activities on the farm level, and regional, national and international exchange of experience are the underlying factors that will lead to the eventual success of Iran's agricultural planning. (Muller-Arizona)
W74-05216

POSSIBILITIES OF SUPPLY AND PROPER USE OF WATER IN THE GARMSAR AREA,
Ministry of Water and Power, Tehran (Iran). Research Div.
For primary bibliographic entry see Field 3C.
W74-05217

EVALUATION OF THE HYDROLOGICAL ASPECTS OF THE AGRICULTURAL STUDIES IN ARID AND SEMI-ARID ZONES OF TURKEY,
Ankara Univ., Adana (Turkey). Faculty of Agriculture.
O. Tekinel.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 225-247. 10 tab, 2 fig.

Descriptors: *Arid lands, *Land use, Water supply, Water supply development, Arid climates, Semi arid climates, Dry farming, Evaporation, Land classification, Hydrologic data, Hydrology, Water utilization, Water demand, Water resources, *Agriculture, Climates, Data collections, Droughts.
Identifiers: *Turkey.

Hydrological and related activities in Turkey, including the definition of climatic zones, the classification used for defining the arid and semi-arid zones, and hydrological activities which have been carried on in Turkey, are discussed. Agricultural drought studies with respect to hydrology and a proposal for drought studies in the agricultural areas of arid and semi-arid zones are summarized. An arid zones research institute should be established to study the problems of the area. Hydrologic surveys are proposed to gather data on climate, land classification, water requirements, water utilization and drought frequency. Studies in evaporation control, usage of water of impared quality, soil-water-plant-energy relationships, and irrigation are proposed. These studies are expected to furnish the necessary data for the evaluation of dryland regions with respect to hydrology and agricultural potential. (Muller-Arizona)
W74-05219

EROSION CONTROL AND VEGETATIV COVER UNDER DRYLAND CONDITIONS I TURKEY,
Istanbul Univ. (Turkey). Faculty of Forestry.
S. Uslu.
In: Agricultural Aspects of Arid and Semi-ari Zones, CENTRO seminar, 1972, p 159-163.

Descriptors: Agriculture, *Arid lands, *Erosio *Soil erosion, *Erosion control, Arid climate Soils, Vegetation, Wind erosion, Weathering, So types, Ground cover effects, Dry seasons, Wind Shelterbelts, Windbreaks, Vegetation effects.
Identifiers: *Turkey.

The morphology of the topography of Turkey such that the moist air of the surrounding seas deflected by the ringing mountains and prevente from reaching the central Turkish plains, causir the central plains to be extremely arid. The soils this region are thus susceptible to wind and wat erosion, both because of the inherent dryness the soil and because of the lack of holding veget tion. Examples of such erosional conditions a cited. Various control measures are proposed, i cluding the construction and cultivation and wir shelterbelts. Specific plant performances in suc belts are reported. Various forms of vegetati cover to hold the soil are also presented. (Mulle Arizona)
W74-05220

WHEAT PRODUCTION PROBLEMS AN POTENTIALS ON DRYLANDS,
Wheat Research and Training Center, Anka (Turkey).
A. Demirlicakmak.
In: Agricultural Aspects of Arid and Semi-ar Zones, CENTRO seminar, 1972, p 172-178. 2 tab.

Descriptors: *Wheat, Agriculture, *Dry farmin *Arid lands, *Irrigation water, Fallowing, Far management, Cereal crops, Grains(Crops), Fie crops, Irrigation, Soils, Soil water, Soil moistur Moisture content, Antecedent moisture, Infiltr tion, Moisture availability, Retention, So management, *Water yield improvement.
Identifiers: *Turkey.

Wheat is the principal agricultural commodity Turkey. The production of this commodity has i creased an average of 33 percent per annum ov the last 20 years to a level where little land remai for agricultural expansion. Much of the land cu rently in cultivations is in arid areas with insuf cient water for optimal production. Curre research is aimed at augmenting the quantities water used in irrigation and improving irrigati methods to increase wheat production. This adc tional irrigation water is to be obtained by wat conservation practices on available precipitati water. These practices include weed control, inf tration encouragement through tillage practice and fallow processes. New varieties of wheat al offer some possibilities in increased productio The Wheat Research and Training Center in A kara, Turkey, is conducting research in the fields. (Muller-Arizona)
W74-05221

LAND AND WATER RESOURCE DEVELO MENT FOR CROP PRODUCTION IN TURKEY
Ankara Univ. (Turkey). Dept. of Agricultural E gineering.
A. Balaban.
In: Agricultural Aspects of Arid and Semi-ar Zones, CENTRO seminar, 1972, p 138-150. 2 tab

Descriptors: *Water resources developmer *Land resources, *Land development, Wat resources, Land, Land Management, Land recl mation, Land use, Water supply, Water supp development, Groundwater, Groundwat resources, Groundwater availability, Irrigation, I rigable land, Irrigation programs, Drainage, Su face drainage, Salinity, Soils.
Identifiers: *Turkey.

Land and water resources, the existing level of development and problems associated with it, and new approaches to such problems on the Turkish peninsula are reviewed. Turkey has a total land area of 78.1 million hectares, of which about 35 percent of this is cultivated, 26 percent is in grass and pastureland and the remaining 39 percent is forest and unproductive land. The agricultural portion has expanded greatly in recent years, in part due to reclamation projects of swamps and wild olive groves. A survey of the available water resources in Turkey shows that the 26 principal drainages in the country have an annual potential of 166 billion cubic meters. Of this about 80 billion cubic meters can be feasibly developed. An additional 8 billion cubic meaters of safe yield groundwater make the annual total available water resources of Turkey 88 billion cubic meters. Existing levels of cropland expansion and irrigation development are discussed. An additional expansion of 25.5 million hectares of agricultural land may be developed from dry lands and supported by the available water resources. (Muller-Arizona)
W74-05222

SYSTEMS ANALYSIS: A DECISION-MAKING TOOL FOR ARID LAND DEVELOPMENT,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 6A.
W74-05223

IMPROVING FARM PRODUCTION IN REGIONS OF LIMITED RAINFALL,
Agency for International Development, Washington, D.C. Office of Agriculture and Fisheries.
O. J. Kelley.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 12-24. 1 tab.

Descriptors: *Dry farming, *Water harvesting, *Rain water, Water conservation, Agriculture, *Arid lands, Farm management, Precipitation(Atmospheric), Soil water, Runoff, Water yield improvement, Water storage, Water supply, Soil-water-plant relationships, Soil moisture, Water management(Applied), Infiltration, Land use, Land management.

Arable land in dry regions is normally irrigated to make it agriculturally productive. Such irrigation is usually done with nearby water supplied. When such water supplies are not availabl, these lands are forced to produce with the limited amount of precipitation water available. These conditions lead to the necessity of dry land farming: the conservation of the limited available precipitation water and its optimal use in agriculture. The first aspect of dryland farming entails runoff loss minimization, soil water storage, crop yield incrementation with increased water supply, snow conservation, and optimal use farming methods. The second aspect involves water harvesting, the increase of available water through collection and redistribution systems. If these aspects are realized, it remains to employ the stored water in the most efficient method possible. This must be done by evaluating the optimal use to which the water and associated land may be put (grazing, cultivation, etc) and the optimum technique by which this use may be realized. These dry land farming procedures, when practiced within an overall development plan, lead to the maximum production of lands with otherwise insufficient water supply. (Muller-Arizona)
W74-05224

THE ARID ZONE PROBLEMS IN TURKEY,
Ankara Univ. (Turkey). Faculty of Agriculture.
S. Elci.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 45-51.

Descriptors: *Agriculture, *Dry farming, *Forages, Pastures, Pasture management, Crop production, Forage grasses, Grazing, Irrigatin practices, Range management, Soil management, Regional development, Irrigable land, Irrigation, Land development, Land management, Arid lands, Arid climates, Asia.
Identifiers: *Turkey.

The population growth rate of Turkey indicates that if its people are to be fed in the future the agriculture of that country must be greatly expanded. Several limiting factors exist concerning such expansion. Much of Turkey's agricultural land is arid. Precipitation is both little and poorly distributed through the growing year. An analysis of agricultural development priorities shows the development and exploitation of pasture lands is a desirable course of action. Several good forage crops which would be useful to this end are not grown in Turkey, although their origin is there. The cultivation of plants for optimal forage production should be based on rotation, soil and climatic conditions for plant production in the region. Twenty-four points of consideration are presented which must be examined to this end. An additional 16 long-term research topics are presented which should be examined for long-range effective agriculture development. The rapid development of arid zone agriculture, such as that required by Turkey, should be conducted along these study guidelines for solid planning bases. (Muller-Arizona)
W74-05225

INVASION OF SEMIDESERT GRASSLAND BY VELVET MESQUITE AND ASSOCIATED VEGETATION CHANGES,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
D. R. Cable, and S. C. Martin.
Journal of the Arizona Academy of Science, Vol 8, No 3, p 127-134, October 1973. 5 tab, 9 fig, 8 ref.

Descriptors: *Succession, *Mesquite, *Grasslands, Grasses, Brush, Desert plants, Range management, Weed control, Grazing, Semiarid climates, Vegetation, Forage grasses, *Arizona, Control, Cutting management, Invasion, Plant populations, Range grasses, Plant groupings.

The encroachment of velvet mesquite on the grass-covered rangeland of the semiarid southwestern United States has become a significant problem to grazing in the last half century. It has been shown that as few as 25 mesquite trees per acre can reduce the available perennial grass production by fifty percent. This study examined several grassland plots at two locations in southern Arizona in an attempt to determine the invasion rates of mesquite into the grassland environment. Stem diameter, plant height, and crown width were the plant parameters considered and plant density was the plant community parameter employed. Four samplings over a 20-year period of record were made and mesquite occurrence data analyzed. Velvet mesquite was found to increase significantly in the study areas during the period of observation. Plots which remained undisturbed during the entire observation period showed dramatic reductions in grass productivity due to mesquite encroachment. Bulldozing and burning of plots interrupt mesquite invastion only temporarily, indicating persistent periodic control measures would be required for proper control. Herbaceous vegetation was not influenced by mesquite population changes as was the perennial grass. Early and repeated control measures are optimum. (Muller-Arizona)
W74-05226

SANTA RITA EXPERIMENTAL RANGE: YOUR FACILITY FOR RESEARCH ON SEMIDESERT ECOSYSTEMS,
Forest Service (USDA), Tucson, Ariz., Rocky Mountain Forest and Range Experiment Station.
S. C. Martin, and H. G. Reynolds.
Journal of the Arizona Academy of Science, Vol 8, No 2, p 56-67, June 1973. 5 fig, 1 tab, 179 ref.

Descriptors: *Desert plants, *Deserts, *On-site laboratories, *Research facilities, Pastures, Climates, Grasslands, Ecology, Range management, Semiarid climates, Arid lands, Ranges, Range grasses, Forage grasses, Brush, Vegetation regrowth, Land use, Sites, Habitats, *Arizona.

The Santa Rita Experimental Range, a 50,000-acre experimental facility 30 miles south of Tucson, Arizona, is a research site for semidesert ecosystems that has been used continuously for 70 years. Rainfall averages from 10 inches per year at the lower elevations to almost 20 inches per year in the uplands. The area is predominantly grass and brushland with a great variety of semiarid land wildlife. To date studies include grazing, range seeding, grass-shrub ecology, wildlife, and desert biomes. Because of its location, the area lends itself to a variety of arid and semiarid land studies associated with hydrology and water resources. Since the Range is purely a study site, the natural environment has been distrubed to a minimum, making Santa Rita Experimental Range an ideal outdoor laboratory. (Muller-Arizona)
W74-05227

REMOVAL OF NITROGEN FROM TILE DRAINAGE-A SUMMARY REPORT, BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE, SAN JOAQUIN VALLEY, CALIFORNIA.
California State Dept. of Water Resources, Fresno. San Joaquin District.
For primary bibliographic entry see Field 5D.
W74-05228

NUTRIENTS FROM TILE DRAINAGE SYSTEMS, BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE, SAN JOAQUIN VALLEY, CALIFORNIA.
California State Dept. of Water Resources, Fresno. San Joaquin District.
For primary bibliographic entry see Field 5B.
W74-05229

PROBLEMS OF THE ORGANIC MATTER OF ORGANOGENIC SOILS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W74-05279

DENSITY OF GROWTH AND LEVEL OF FERTILIZATION AS INFLUENCING THE WATER CONSUMPTION OF MAIZE, (IN BULGARIAN),
Academy of Agricultural Sciences, Chirpan (Bulgaria). Inst. of Cotton.
G. Nikolov.
Rasteniev'd Nauki. Vol 9, No 4, p 69-82. 1972. Illus. (English summary).
Identifiers: *Fertilization, *Growth, *Corn(Field), Water consumption, *Bulgaria, Irrigation.

The water consumption of maize grown under irrigation on leached chernozem smolnitsa soil was studied in 1966-1969 at crop stands of 32,000, 44,000 and 58,000 plants/ha, at row spacings of 70 and 90 cm and at levels of fertilization in kg/ha of N100P80K10 and N200P160K80. The consumptive use of water of maize varies comparatively a little with increasing the number of plants per hectare and with raising the level of fertilization and does not vary in dependence on the inter-row spacings. A rectilinear relation exists between the 24-hr values of the consumptive use of water, the leaf area, the increment in the biological yield and net productivity of the photosynthesis which determines the correlation between the rhythm of water consumption during the crop-season and the related productivity of organic substance. Water withdrawn from the upper 50 cm soil layer accounts for 66.8-68.9%. from the 51-100 cm layer for 23.8-25.0%, and from the 101-200 cm soil layers

for 7.2-8.5% of the water consumption of maize. The total amount of irrigation water given to the crop accounts for 37.0-37.5%, rainfall during the crop-season for 37.1-39.3% and the withdrawal from the water stored in the soil accounts for the least percentage. The consumptive use of water of maize grown in South-Bulgarian chernozem smolnitsa soils, at a crop density of 44,000 plants/ha and at fertilizer level of N200P160K80 in kg/ha amounts to 523 mm and its 24-hr values average 3.96 mm. The biological coefficient of water consumption after A. M. Alpatev varies between 0.46 and 0.51 and has a mean value of 0.50.--Copyright 1973, Biological Abstracts, Inc.
W74-05339

EFFECT OF AN EXCEPTIONAL STORM ON SOIL CONSERVATION AT SAMARU, NIGERIA,
Institute for Agricultural Research, Zaria (Nigeria).
For primary bibliographic entry see Field 2J.
W74-05340

IN VITRO INTERACTIONS OF FUSARIUM AND VERTICILLIUM WILT FUNGI WITH WATER, PH AND TEMPERATURE,
J. B. Manandhar, and G. W. Bruehl.
Phytopathology. Vol 63, No 3, p 413-419. 1973. Illus.
Identifiers: *Cotton diseases, *Fungi, *Fusarium-Oxysporum-F.-Sp.-Vasinfectum, Growth, In-vitro interactions, Soils, Temperature, *Verticillium-Albo-Atrum, Wilt, Hydrogen ion concentration.

Fusarium oxysporum f. sp. vasinfectum and the microsclerotial form of Verticillium albo-atrum pathogenic to cotton grew progressively slower in soil as the predominantly matric water potentials in soil were lowered below 0. In contrast, both fungi grew optimally at about -10 to -30 bars at 25C in either agar media or in soil when water potential was regulated osmotically. The osmotic stimulation of both fungi was independent of the solute used and occurred in agar media when water potentials were adjusted with NaCl, KCl, CaCl2, MgCl2, a salt mixture, or sucrose, and on straw in sterile soil when water potentials were osmotically adjusted. At water potentials below the stimulatory range, growth decline linearly and was zero at near -100 bars for V. albo-atrum and at near -115 bars for F. oxysporum. A water stress of -40 to -60 bars reduced the growth of both to about half the maximum rate. Both fungi grew well at pH values ranging 5.2-8.6, and no significant interactions of pH and water potential were observed. A highly significant temperature X water interaction occurred in both wilt fungi: the magnitude of growth stimulation with slightly reduced osmotic water potential increased with rising temperature. No new in vitro responses to water, pH, temperature, or to interactions of these were observed that explain the different distributions of these wilt fungi in nature.--Copyright 1973, Biological Abstracts, Inc.
W74-05341

EFFECT OF GREEN FERTILIZER ON GRAPE YIELD,
For primary bibliographic entry see Field 5B.
W74-05346

PRELIMINARY LABORATORY TESTS FOR THE CONTROL OF ALGAE IN RICE FIELDS (IN ITALIAN),
Milan Univ. (Italy). Istituto di Patologia Vegetale.
For primary bibliographic entry see Field 5C.
W74-05357

WATER PROPERTIES AND WATER REGIME OF SOD PODZOLIC SOILS AND MEANS OF THEIR IMPROVEMENT (IN RUSSIAN),
K. I. Baltyan.
Tr Vses Nauchno-Issled Inst Udobr Agropochvoved. 47. p 193-202, 1970.
Identifiers: Cereal crops, Frost, Grass, Perennial grasses, Plowing, Potato, Pulses, *Sod podzolic soils, Soils, Spring, Water supply, Winter, *Root zone, *USSR(Moscow region).

The water supply for crops on sod podzolic soils in the Moscow region, USSR, may be improved by a single meliorative plowing, whereby the humus horizon is left on the top and the underlying podzolic and illuvial horizons are intermixed. Thus, the depth of the root zone may be extended to 30 cm in the northern and eastern regions and to 40 cm in the southern and western regions of the non-chernozem zone for perennial grasses and winter crops that complete their growth before the onset of autumn frosts. For spring cereal crops, pulses, potatoes and other crops of low resistance to frost, the root zone can be deepened to 20 and 30 cm.--Copyright 1973, Biological Abstracts, Inc.
W74-05370

THE USE OF MINERAL FERTILIZERS IN IRRIGATION WITH PURE WATER, SEWAGE AND LIQUID MANURE, (IN RUSSIAN),
Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Leipzig (East Germany). Institut fuer Mineraldueng.
R. Koriat, and G. Shpekht.
Tr Vses Nauchno-Issled Inst Udobr Agropochvoved. 47. p 177-186. 1970.
Identifiers: Beet, Clover, *Fertilizers(Mineral), Fodder, Grass, Irrigation, Liquid manure, Minerals, Nutrition, Potato, Pure, *Sewage, Sugar, Nitrogen, *Farm wastes, *Nutrients, *Phosphorus.

More nutrients, especially P, are extracted by the field crops irrigated with plain water than without irrigation. The N doses and irrigation rates for sugar and fodder beets, potato, grasses and clover recommended in the German Democratic Republic are given. The amount of nutrients in sewage cannot compensate the large uptake by the crops (on the average, 100 mm communal sewage contains 60 kg N, 76 kg P2O5 and 42 kg K2O). Sprinkling with sewage is supplemented with P 70-90 and K 80-100. N fertilizers are especially important. The doses of liquid manure and its application dates for field crops and hay cutting pastures are given. Liquid farmyard manure contains 0.45% N, 0.08% P and 0.23% K. Assimilation of nutrients from liquid manure amounts to 40-80% N, 55-90% K, depending upon the dates of application. The utilization factor for P is 50%.--Copyright 1973, Biological Abstracts, Inc.
W74-05371

MOISTURE AND TEMPERATURE REGIMES IN THE SOUTHERN-TAIGA SOILS OF CENTRAL SIBERIA AND HABITAT CONDITIONS FOR CROPS, (IN RUSSIAN),
V. T. Kolesnichenko.
Inf Byull Sib Inst Fiziol Biokhim Rast Sib Otd Akad Nauk SsSR. 6. p 140-142. 1970.
Identifiers: Air, Crops, *Moisture, Soils, *Temperature, Thermal regime, *USSR(Biryusa River), *Podzolic soils.

Observations were carried out on sod podzolic and gray forest podzolized soils on the left bank of the Biryusa River, north of Taishet, USSR. The hydrothermal air regime features in the soils and the adjacent 0-200 cm air layer were determined. The determinations include the drop of air temperature at night in the different phases of plant development, the types of frosts in air and on the soil surface, and their effect on the temperature regime in the top 50-cm-layer of soil.--Copyright 1973, Biological Abstracts, Inc.
W74-05373

EFFECT OF CROPS AND THEIR PREDECESSORS ON THE AGGREGATE COMPOSITION OF MEADOW SIEROZEM SOILS, (IN RUSSIAN),
P. S. Bulakhova.
Tr Kaz S-Kh Inst. Vol 13, No 2, p 117-121. 1970.
Identifiers: Barley, Beet, Corn, *Crops, Meadow, Peas, *Sierozem soils, Wheat, *Soil aggregates.

The aggregates were separated on sieves in water after preliminary capillary saturation of the soil sample. Observations indicated that the meadow sierozem soils possess good water-stable structure. The total aggregates larger than 0.25 mm in the top 60-cm layer make up from 65-79%, of which the most valuable aggregates, 5-1 mm, amount to 26%. The effect of different crops on the aggregate composition of the soil varies. Under corn the total aggregates exceeded by 6-8% the amount under wheat, down to a depth of 40 cm; it was higher by the same amount under wheat at the depth of 40-60 cm, and mainly on account of aggregates measuring 2-1 mm. The content of aggregates was markedly lower under barley following wheat after beet, down to 45-28%, while aggregates measuring 5-1 cm dropped to 19-25%. The decline was marked in particular among aggregates 2-1 mm, being only 11% in the upper horizon under barley, as against 32 and 20% under corn and wheat, respectively. The effect of pea crops on soil structure proved to be most favorable.--Copyright 1973, Biological Abstracts, Inc.
W74-05374

SOME DATA ON SECONDARY SALINIZATION OF KRASNOZNAMENSKII IRRIGATED MASSIF, (IN RUSSIAN),
K. E. Burzi.
Ahrokhim Hruntozn Resp Mizhvid Temat Zb. 15. p 186-190. 1070.
Identifiers: *Irrigation, Massif, *Salinization(Soils), *USSR(Krasnoznamenskii),, *Saline soils, Drainage.

The rise of the groundwater levels from 4 to 2 m, due to filtration from the main canal and the irrigation network, led to secondary salinization of low-lying areas on the territory of the 'Pamyat' Il'icha' State Farm (sovkhoz), USSR. Swamping and secondary salinization can be stopped and prevented by drainage.--Copyright 1973, Biological Abstracts, Inc.
W74-05376

AGROCHEMICAL PROPERTIES AND FORMS OF PHOSPHATES IN TYPICAL SIEROZEMS IRRIGATED AT VARIOUS TIMES, (IN RUSSIAN),
M. M. Tashkuziev.
Nauchn Tr Tashk Univ. 378. p 187-194. 1970.
Identifiers: *Agrochemical properties, Irrigation, *Phosphates, *Sierozems, *Soil types, Fertilizer.

Data are presented on the studies conducted on virgin, newly irrigated and old-irrigated soils.--Copyright 1973, Biological Abstracts, Inc.
W74-05377

THE EFFECT OF DIFFERENT TILLAGE METHODS ON THE PHYSICAL PROPERTIES OF SOIL, (IN RUSSIAN),
Grodnenskii Selskokhozyaistvennyi Institut (USSR).
For primary bibliographic entry see Field 2G.
W74-05378

EFFICACY OF LARGE DOSES OF MINERAL FERTILIZERS IN IRRIGATED SOILS, (IN RUSSIAN),
Z. Ban'okh.
Tr Vses Nauchno-Issled Inst Udobr Agropochvoved. 47. p 169-176. 1970.
Identifiers: Alfalfa, Beets, Corn, *Fertilizers(Mineral), Irrigation, Minerals, Potato, Sugar, *Czechoslovakia, *Soils(Irrigated), *Phosphorus, *Potassium.

Long-term experiments were conducted in the main irrigated regions of Czechoslovakia with doses of P and K for potato, alfalfa, sugar beet and corn. Large doses of fertilizers were slightly effective, but the use of such doses should be considered from the standpoint of improving soil fertility.--Copyright 1973, Biological Abstracts, Inc.
W74-05379

ECONOMIC ASPECTS OF A NUCLEAR DESALINATION AGRO-INDUSTRIAL PROJECT IN THE UNITED ARAB REPUBLIC,
New York State Coll. of Agricultural and Life Sciences, Ithaca. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3A.
W74-05382

THE ECONOMIC EFFICIENCY OF INTERBASIN AGRICULTURAL WATER TRANSFERS IN UTAH: A MATHEMATICAL PROGRAMMING APPROACH,
Water Research Lab., Logan.
For primary bibliographic entry see Field 4A.
W74-05385

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

THE APPLICATION OF BINARY TREE STRUCTURES TO HYDROLOGIC NETWORK SIMULATORS,
Nebraska Univ., Lincoln. Dept. of Computer Science.
G. McManis.
Available from National Technical Information Service as PB-228 698 $8.00 in paper copy, $1.45 in microfiche. MS Thesis, May 1972. 94 p, 28 fig, 3 tab, 10 ref, 5 append. OWRR B-016-NEB(1).

Descriptors: *Simulation analysis, *Hydrographs, Storms, *Computer programs, *Drainage systems, Channels, *Networks, Runoff, Systems analysis, Mathematical models, *Nebraska, City planning, *Urban drainage, Storm drains.
Identifiers: Lincoln(Neb).

Dynamic simulation techniques can provide urban water planners with needed hydrologic response information. Such techniques for modeling the interactions between (1) a storm bounded by a generalized polygon, and (2) any arbitrarily distributed network over which the storm passes are described and demonstrated. A simulator for the hydrologic response of any encoded channel network has been designed and implemented in FORTRAN. The network is represented by a binary tree structure within which the topologic connections, geometric and other attributes of its segments can be introduced, altered, and retrieved by a set of programmed functions. The comprehensive computer package can model either the behavior of existing drainage systems or the expected performance changes from modification of drainage systems. The simple, yet detailed distributed model has the potential of revealing worst-case velocities or patterns for moving storms. The model has been applied to an existing drainage system, simulating both the runoff at any point and the cumulative behavior in relation to a given storm description. (Bell-Cornell)
W74-04852

THE IDENTIFICATION AND QUANTIFICATION OF THE NET EFFECTS OF MULTIPLE-PURPOSE RIVER BASIN DEVELOPMENT,
Georgia Univ., Athens. Inst. of Natural Resources.
R. M. North, and J. Sellers.
Available from National Technical Information Service as PB-228 588 $11.50 in paper copy, $1.45 in microfiche. Environmental Resources Center, Georgia Institute of Technology, Atlanta, Report ERC-0773, June 1973. 155 p, 5 fig, 16 tab, 189 ref, 2 append. OWRR A-040-GA(2). 14-31-0001-3810.

Descriptors: *Evaluation, *Project feasibility, *River basin development, *Cost benefit analysis, *Social aspects, *Economic feasibility, Project planning, Water control, *Appalachian Mountain Region, Alternative costs, Flood control, Water quality, Tennessee Valley Authority, North Carolina.
Identifiers: Upper French Broad River basin(N.C.), Multiple objective planning.

A methodological and pragmatic basis is presented from which to measure and evaluate future river basin development projects within the framework of multiobjective principles and standards. The Upper French Board River Basin and a proposed 14-reservoir TVA project within the basin were selected for a case study of traditional benefit-cost analysis and subsequent multiple-objective comparisons with the national economic development, environmental, social, and regional economic development analyses. The areas of economic theory and public finance were integrated with the environmental aspects to develop a systematic process for evaluation of benefits and costs considering resources displaced as well as environmental and social costs imposed. The benefits claimed and views held for public investments in water resources by various interest groups were explored for the region. No significant relationship between the presence of water resources projects and economic activity was found for a region in which water resources is not the limiting factor in the economic mix. Specific methodological and field level improvements are suggested for future water resources project evaluation to insure consideration of the complete range of alternative solutions to flood control, recreation, water supply and other problems while minimizing adverse economic, environmental, and social impacts.
W74-04854

OPTIMIZATION OF OPERATION OF A SYSTEM OF FLOOD CONTROL RESERVOIRS,
Missouri Univ., Columbia. Dept. of Civil Engineering.
A. T. Hjelmfelt, Jr., and N. X. Tsiourtis.
Available from National Technical Information Service as PB-228 606 $9.75 in paper copy, $1.45 in microfiche. Missouri Water Resources Center Completion Report, July 1973, 122 p, 37 fig, 8 tab, 9 ref, 2 append. OWRR B-065-MO(1). 14-31-0001-3607.

Descriptors: *Flood control, *Probability, *Linear programming, *Optimization, *Reservoir operation, *Reservoir releases, Time series analysis, Computer program, Hydrographs.
Identifiers: *Kansas River basin.

Probabilistic methods of hydrology and optimization techniques were used to determine an optimal sequence of releases from a system of reservoirs during a flood emergency. The operation schedule for a reservoir was determined from estimated inflow to the reservoir, current reservoir contents and downstream conditions. Linear programming was used to establish the optimal operating procedure. The duration of the flood producing storm was divided into a series of equal time increments, an inflow into each reservoir estimated for each time increment and a release made from each reservoir during each time increment. The objective function (to be maximized) was taken to be the sum of all reservoir releases during the duration of flood inflow to the reservoirs.
W74-04858

PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART 2. SOUTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 6D.
W74-04915

A STOCHASTIC SNOW MODEL TO EVALUATE RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
M. M. Fogel, L. Duckstein, and C. C. Kisiel.
Paper presented at 54th Annual Meeting of American Geophysical Union, April 16-20, 1973, Washington, D.C. 20 p, 5 fig, 10 ref. OWRR B-032-ARIZ(4).

Descriptors: *Snowmelt, *Runoff forecasting, *Reservoir operation, *Statistical models, *Stochastic processes, Melting, Temperature, Rainfall, Snowpacks, Water equivalent.

A methodology is given to forecast snowmelt to allow managers of water resources systems to regulate reservoir releases to minimize expected losses. Using an event-based precipitation model, a distribution function of water available for runoff is obtained. The amount of water available for runoff is the sum of the water equivalent of snow on the ground at the time the forecast is made, and the predicted amount of precipitation during the forecast period. A melt coefficient, a random variable, is a function of predicted temperature. The distribution function of snowmelt runoff is the product of the two random variables involving the predicted precipitation and temperature. A one-period objective function is defined to determine a reservoir release rate which would minimize expected losses. (Knapp-USGS)
W74-04918

HYDROLOGIC CHARACTERISTICS OF ALDER CREEK, IRON COUNTY, WISCONSIN,
Geological Survey, Madison, Wis.
B. K. Holmstrom, W. A. Gebert, and R. G. Borman.
Open-file report, June 1973. 10 p, 9 fig, 8 tab, 6 ref.

Descriptors: *Streamflow, *Sedimentation, *Wisconsin, *Reservoirs, Floods, Peak discharge, Low flow, Sediment yield, Hydrologic data, *Pre-impoundment.
Identifiers: Alder Creek(Wisc).

The hydrologic characteristics of Alder Creek, Iron County, Wisconsin, were studied so that water-resource planners could evaluate a reservoir site. The hydrologic characteristics estimated were the mean flows, low flows, flood peaks, suspended-sediment discharge, and depth to bedrock. Also included is an estimate of the time required to fill the proposed reservoir. The probable maximum flood (PMF) at the damsite of the proposed reservoir has a peak of 41,000 cfs and a 24-hour volume of 19,700 acre-feet. A full reservoir reduces the time of concentration of storm runoff, which results in a higher peak discharge than under preimpoundment conditions. The estimated filling times ranged from 18 months for an elevation of 1,410 feet to 76 months for an elevation of 1,430 feet. Sediment deposition was estimated to be 220 tons per year. (Knapp-USGS)
W74-04920

REASONABLE STATE REGULATION OF THE INTERSTATE TRANSFER OF PERCOLATING WATER,
Cornell Univ., Ithaca, N.Y.
M. D. White.
Available from the National Technical Information Service as PB-229 087, $4.50 in paper copy, $1.45 in microfiche. Technical Report 64, Cornell University Water Resources and Marine Sciences Center, Ithaca, N.Y., May 1973. 24 p. OWRR A-027-NY(3). 14-01-0001-1852.

Descriptors: *Water supply, Water resources, *Water transfer, *Interstate, *Water law, *State jurisdiction, *Percolating water, Federal jurisdiction, New York, Regulation, Water pollution control, Groundwater.
Identifiers: Property rights.

Recently, Federal and State agencies have instituted water management and programs to prevent and/or clean up water pollution for purposes of maintaining the availability of adequate water supplies. Significant problems in water supply, however, result in transferring quantities of water between states. In view of the present national water crisis, Federal government regulation of interstate water transfer is often advocated. But in the absence of Federal action, the states must protect and manage their own groundwater resources. States can protect their percolating water resources only by valid conservation laws, not by antiexport statutes which discriminate against out-of-state users. (Bell-Cornell)
W74-04980

A STUDY OF THE RELIABILITY OF CONTINUOUS WATER QUALITY MONITORING,
Tennessee Univ., Knoxville. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W74-04982

DETAILED PROJECT REPORT, DYERSBURG, TENNESSEE, FINLEY STREET AREA.
Army Engineer District, Memphis, Tenn.
July 1972. 19 p, 6 plates, 2 tab, 4 append.

Descriptors: *Levees, *Flood control, *Sumps, *Institutional constraints, *Project planning, Flood protection, Drainage, Pumping, Drainage programs, Cost-benefit analysis, Project purposes, Channel improvement, Hydraulics, Environmental effects, Recreation, *Tennessee.
Identifiers: *Urban renewal, Gravity outlets, Dyersburg(Tenn), North Fork, Forked Deer River(Tenn), Environmental impact.

The purpose of the project is to provide flood protection to the southwestern sector of Dyersburg, Tennessee, north of the North Fork, Forked Deer River. The area, adjacent to th central business district, contains both commercial and residential land uses, as well as being the site for an urban renewal program under the Department of Housing and Development. Plans were formulated with a primary objective of providing the 50 and 100 year flood protection requirements of the Federal Housing Administration for the urban renewal area. Construction of a levee is proposed. This necessitates provisions for interior drainage of the area. Drainage is primarily through two small channels tributary to the Forked Deer River. Several project features are designed to provide protection for all interior areas above elevation 269 feet mean sea level: (1) gravity outlets, which will discharge runoff through culverts under the levee; (2) excavated sump on the landside of the levee to provide approximately 148 acre feet for storage of interior runoff; (3) pumping station and outlet structure, when the excavated sump does not provide sufficient storage; and (4) interior channeling to transition flows into the excavated sump. A cost-benefit analysis is included. (Hoffman-North Carolina)
W74-04989

FLOOD PLAIN INFORMATION: BIG BUFFALO CREEK-LITTLE BUFFALO CREEK--CITY OF SANFORD, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
Prepared for the City of Sanford, North Carolina. June, 1973. 24 p, 10 fig, 5 tab, 22 plates.

Descriptors: *Flood data, *Peak discharge, *Overflow, *Flood plains, Flood recurrence, Maximum probable flood, Flood profiles, Flood damage, Hydrograph analysis, Streams, *North Carolina.
Identifiers: *Big Buffalo Creek(N.C.), Little Buffalo Creek, Sanford(N.C.), Intermediate Regional Flood, Standard Project Flood.

Areas of Sanford subject to flooding from Big Buffalo Creek between McNeil Road and Wicker Steet Extension (3.11 miles), and from Little Buffalo Creek, between Northview Road and Rose Street (4.6 miles) are identified. Total drainage area of Big Buffalo Creek is 20.8 square miles; while the total drainage area of Little Buffalo Creek is 11.5 square miles. Property within flood plains, primarily residential and commercial, has been damaged by previous floods in 1945, 1952, and 1954. Development of the extensive open spaces along the creeks, expected with the expansion of the City of Sanford, would increase the severity of flood damage. Flood impact assessments are based upon estimated peak flows of the Intermediate Regional Flood, defined as one that could occur once in 100 years on the average, and the Standard Project Flood, defined as a major flood culminating from a severe combination of meterological and hydrological conditions. Peak discharges are given for selected locations. For Big Buffalo Creek at McNeil Road, peak discharges are estimated at 6,400 cubic feet per second for the Intermediate Region Flood and at 12,340 cubic feet per second for the Standard Project Flood. For Little Buffalo Creek at Northview Road, peak discharges are estimated at 2,600 cubic feet per second for the Intermediate Regional Flood and at 5,170 cubic feet per second for the Standard Project Flood. Discharge hydrographs are included. The relative water surface elevations for the Intermediate Regional Flood and the Standard Project Flood are graphed. Overflow limits for both Big Buffalo Creek and Little Buffalo Creek are detailed on contour maps. (Hoffman-North Carolina)
W74-04993

FLOOD PLAIN INFORMATION; ROANOKE RIVER-CHOCOYOTTE CREEK; CITY OF ROANOKE RAPIDS AND TOWN OF WELDON, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
Prepared for the City of Roanoke Rapids and the Town of Weldon. June, 1973. 34 p, 10 fig, 7 tab, 16 plates, glossary.

Descriptors: Floods, *Flood data, *Flood profiles, Flooding, *Flood frequency, Flood damage, Flood control, Flood plain zoning, Flood plain, Historic floods, *North Carolina, Land use, Flood recurrence interval, Maximum probable flood.
Identifiers: Roanoke River(N.C), Chocoyotte Creek(N.C.), Roanoke Rapids(N.C.), Intermediate Regional Flood(IRF), Standard Project Flood(SPF), Weldon(N.C.).

Flooding from Roanoke River and Chocoyotte Creek has severely damaged the towns of Roanoke Rapids and Weldon in 1912, 1940, 1944, and 1945. To aid flood plain utilization and flood damage reduction, areas subject to possible future floods are identified. Factors affecting the flood intensity in these areas include floodflow obstruction, floodflow reduction measures, evacuation plans, and material storage on the flood plain. The Intermediate Regional Flood (IRF) is defined as a flood that could occur once in 100 years, while the Standard Project Flood (SPF) is a major flood expected to occur from the most severe meteorological and hydrological conditions. The extent of flooding, velocity of flow, and rates of rise and duration of flooding are calculated for both bodies of water and types of floods. Floods on the Roanoke River are characterized by slow rates of rise and long duration above flood stage, while floods on Chocoyotte Creek rise to a peak quickly, but with shorter duration. Areas covered by both flood types would be extensive and include commercial, industrial, and residential areas, but due to wider extent, greater depth of water, higher velocity of flow, and longer duration of flooding, damage Standard Project Floods is more severe than during Intermediate Regional Floods. (Grden-North Carolina)
W74-04994

PLANNING FOR THE ULTIMATE HYDRAULIC DEVELOPMENT OF THE NILE VALLEY,
H. A. W. Morrice, and W. N. Allan.
Proceedings, Institution of Civil Engineers, Vol 14, p 101-156, October, 1959 18 fig, 13 tab.

Descriptors: *Computer models, *Irrigation, *River forecasting, River basin development, Planning, *Simulation analysis, River regulation.
Identifiers: *Nile River Valley Plan.

Computer simulation was used to determine the best way to control the Nile River and its tributaries in order to maximize water available for irrigation. Possible sites for control works on the Nile and its tributaries were identified, and working arrangements between them specified. These then took the form of algebraic control equations. Assumed quantities of water to be abstracted at various points in the Sudan and at Aswan in Egypt were stated as proportions of the net volume available. River behavior between 1905 and 1952 was used in the analysis. Time lags, transmission and evaporation losses, and the initial content of reservoirs were taken into account. Flow diagrams summarize the logic. The final result, the Nile River Valley Plan, is the product of successive improvements in the control equation. It gives maxima and minima for reservoir contents and controlled discharges, evaporation losses, benefits from certain conservation works, volumes of water available for irrigation, and figures for hydro-electric power. (Hoffman-North Carolina)
W74-04997

ECONOMETRIC MODEL FOR RIVER BASIN PLANNING,
M. Borlin.
Organization for Economic Cooperation and Development, Paris. Series: Problems of Development. 1971. 94 p, 5 fig, 9 tab, 86 ref, 2 append.

Descriptors: *River basin development, *Simulation analysis, *Econometrics, Benefit-cost analysis, Forecasting, Decision-making, Methodology, *Alternative planning.

A simulation model that would enable the policymaker to analyze the effects of alternative river basin development schemes on target variables, such as total population, employment rate, and income per head of household is presented. Final selection of the best development project can then be determined by cost-benefit analysis. The model attempts to internalize as many variables as possible, so that the model is nearly closed. It is modular in form, with submodels being concerned with the agricultural sector, the demographic sector, the employment sector, the income sector, and the water sector. The river basin is divided into subregions. Although the model of each subregion incorporates all the different subsectors, the subregions themselves are only linked through the water subsector. The water outflow of the upstream subregion is the inflow of the downstream subregion. The model is dynamic in that it includes explicit feedbacks, loops, delays, and time-relate variables. Results are given year by year. (Hoffman-North Carolina)
W74-04999

WATER MANAGEMENT,
Netherlands Universities Foundation for International Co-Operation, The Hague.
M. Klasema.
Planning and Development in the Netherlands, Vol 4, No 1, p 8-27, 1970. 8 fig, 5 photos.

Descriptors: *Water management(Applied), *Reclamation, *Land reclamation, *Water quality, *Salinity, Land management, Flood control, Dikes, Lakes, Water, Reservoirs, Drainage systems, Water level, Sluices, Water demand, Water policy, Water supply, Sea water.
Identifiers: *Netherlands(Zuiderzee), Act for Enclosure and Partial Reclamation of the Zuiderzee, North Sea, Polders.

Water management has played an importent role in the Netherlands way of life. As early as the twelfth century, the Dutch built dikes to discourage flooding. However, it was not until the nineteenth century that technology provided the tools for reclaiming polders from the sea. A plan suggested fifty years ago by engineer Cornelis Lely forms the basis of the Act for the Enclosure and Partial Reclamation of the Zuiderzee. It specified separating the Zuiderzee from the North Sea with a closed dike, laying out polders around the Zuiderzee, and maintaining large fresh water basins within the enclosure. Border lakes are now being created between the polders and the mainland. These lakes are divided into reservoirs to improve the quality and level regulation of the water. Water quality, especially with regard to salt content, is important since the water washes through the reservoirs and is used for irrigation and for consumption. Such reservoirs also serve as a safeguard for water quality in the event of calamity in the enclosure. In the future, the water supply of the Netherlands may be centralized, using the Zuiderzee area as the largest source of storage. (Grden-North Carolina)
W74-05000

THE ZUIDERZEE WORKS WITHIN THE FRAME OF PHYSICAL PLANNING,
Netherlands Universities Foundation for International Co-Operation, The Hague.
L. Wijers.
Planning and Development in the Netherlands, Vol 4, No 1, p 42-61, 1970. 26 fig.

Descriptors: Reclamation, *Land reclamation, *Optimum development plans, *Comprehensive planning, *Area redevelopment, *Water control, *Land farming, Drainage systems, Sea water, Land use, Urbanization, Long-term planning, Gulfs, Land management, Vegetation establishment, Regional economics, Dikes.
Identifiers: *Netherlands(Zuiderzee), Landscape development, Open plan, Polders, Conurbation, Wieringermeer(Neth), Noordoostpolder(Neth), Oostelijk Flevoland(Neth), Zuidelijk Flevoland(Neth), Markerwaard(Neth).

The reclamation from the sea of the Netherlands' Zuiderzee area adds one-fifth of the country's total surface and shortens the distance between the northern and western parts by one-third. Four polders have been reclaimed sequentially since 1930, with the fifth to be ready by 1980. Through this time sequence, each polder acquires a function determined by the social and economic conditions at its construction time. Using knowledge obtained with each previous polder, State authorities lay dry polders with regard for an optimum physical plan. For example, the recently reclaimed polders provide additional space for urbanization. While plans to build a given number of villages in each polder were drawn up, most were modified by unpredictable conditions. Modifications included reduction in number of villages created, erection of service centers and shifting of agricultural areas. Thereefore, an 'open plan,' concerned with structure, or 'the way in which the parts are arranged with respect to one another' is used. The plan is not static, and while each part will develop a distinct form, this form will not inhibit future development. Course of development is more important than pinpointing the future. Coordination and communication among those dealing with physical planning is also essential for planning a well balanced environment. (Grden-North Carolina)
W74-05001

AGRICULTURAL ASPECTS,
Netherlands Universities Foundation for International Co-Operation, The Hague.
H. Smits.
Planning and Development in the Netherlands, Vol 4, No 1, p 62-78, 1970. 9 photos, 1 tab.

Descriptors: *Agriculture, *Reclamation, *Land reclamation, Land management, *Farm management, Dikes, Canals, Vegetation establishment, Drainage systems, Crops, Evaporation, Permeability, Land use, Soil management, Soil structure, Soil structure, Soil environment.
Identifiers: *Netherlands(Ijsselmeer polders), Block parcelling system, Soil mapping, Lease holding, Tenant farmers, Cooperative farmers, Land allotment, Marine soils, Agricultural Holding Act, Ministry of Agriculture and Fisheries(Neth).

The agricultural aspects of reclaiming the IJsselmeer polders in the Netherlands are integrated with the drainage process of the polder. A dike is erected, and pumping stations are installed. Reeds are sown to promote evaporation. Over a ten-year period, networks for water channels and roads are laid out, subdividing the land into tracts. Optimum lot size is determined by costs of land use and layout. Reclamation begins two to twelve years later with destruction of reed vegetation and preparation of the soil for sowing. The State then farms the land for five years. During this period, soil is improved, farm dwellings are constructed, and electric and telephone cables are installed. Later, the agricultural destination of the land is determined to be grassland farming, arable farming, mixed farming, fruit growing, or horticulture, depending on the soil profile. Land is then allocated to private enterprises of one to four workers. Size of enterprises have been increasing as technical potential and wages have risen. Enterprises growing vegetables and flower bulbs vary in size from 7.4 to 19.7 acres, fruit growing farms from 14.8 to 37 acres. Land is leased for a term of years or on a perpetual long lease. Enterprises may be sold outright in the future. The relationship between gross yield and costs causes reasonable income to be earned. While farmers may manage their lands as they desire, cooperation between enterprises exists with respect to large farming implements and fertilizers. Financial matters are handled mainly by cooperative farmers loan banks. (Grden-North Carolina)
W74-05002

RECREATION IN THE OPEN AIR,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 6B.
W74-05003

EXPERIMENT IN RAPID LEACHING OF SALINE SOILS IN THE GOLODNAYA STEPPE (OPYT USKORENNOY PROMYVKI ZASOLENNYKH POCHV GOLODNOY STEPI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 3C.
W74-05018

RHODE ISLAND'S BARRIER BEACHES: VOLUME II. REPORTS AND RECOMMENDATIONS AT THE COMMUNITY LEVEL,
Rhode Island Univ., Kingston. Coastal Resources Center.
For primary bibliographic entry see Field 2J.
W74-05033

COLLABORATION OF THE U.S.S.R. AND THE U.S.A. IN THE FIELD OF HYDRAULIC ENGINEERING AND LAND RECLAMATION,
For primary bibliographic entry see Field 6E.
W74-05076

PULSE-TEST RESPONSE OF A TWO-ZONE RESERVOIR,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 4B.
W74-05077

NORTH SLOPE - CONSTRUCTION CRITERIA FOR ROADS AND FACILITIES,
Atlantic Richfield Co., Dallas, Tex.
W. P. Stokes.
Journal of Petroleum Technology, Vol 23, No 10, p 1209-1214, October 1971. 4 fig, 3 tab, 8 ref.

Descriptors: *Arctic, *Cold regions, Construction, *Road construction, *Alaska, Permafrost, Foundations, Drainage, Thawing, Snow, Wind pressure, Gravels, Piles(Foundation), Buildings, Ice.
Identifiers: *North Slope(Alas), Prudhoe Bay(Alas), Sag River(Alas).

The North Slope of Alaska is located in a continuous permafrost zone where the subsurface soils are permanently frozen to depths as great as 2000 feet. The top foot or so of soil - called the active layer - thaws in summer and refreezes in winter. Permanent road construction requires that the road be built in such manner that the insulating tundra cover is preserved intact and undamaged. Consequently, surface grading and side ditching are ruled out. Culverts are installed above the tundra surface. Adequate quantities of gravel are available in the vicinity of Prudhoe Bay. The gravel should be fairly well graded with sufficient fines to act as a binder; yet it must contain less than 3 percent of material finer than 0.02 mm. A 5-ft.-thick gravel fill usually is adequate, although a somewhat thicker layer may be needed to prevent the thaw from extending into the active zone. Buildings, structures, and other facilities must be designed to meet government regulations and operational requirements. Local conditions of wind velocity and snowfall must be considered. Permanent, heated structures are supported on pile foundations with several feet of free air space under the building. Drill sites are covered with a 5-foot layer of gravel. Skid-mounted rigs are used and the skid rails are supported on timbers to allow circulation of air under the drilling rig. All utility lines that are subject to freezing are protected by insulation, heat tracing, or are placed in heated utilidors. (Gray-NWWA)
W74-05104

FLOOD STAGES AND DISCHARGES FOR SMALL STREAMS IN TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-05107

PROBLEMS IN HYDROLOGIC FORECASTING (VOPROSY GIDROLOGICHESKIKH PROGNOZOV).
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, T.N. Makarevich, editor, Leningrad, 1972. 128 p.

Descriptors: *Hydrology, *Meteorology, *Forecasting, River forecasting, Streamflow forecasting, Flood forecasting, Flood routing, Hydrograph analysis, Discharge(Water), Runoff, Inflow, Reservoirs, Precipitation(Atmospheric), Atmosphere, Air circulation, Temperature, Ice, Seasonal, Correlation analysis, Equations.
Identifiers: *USSR, Heat exchange, Traveltime, Hydrometric stations.

Development of river-forecasting procedures is examined in this collection of 9 papers published by the State Hydrologic Institute in Leningrad. Methods are presented for preparation of long-range forecasts of duration of ice phenomena on the Danube River, severity of winters in Central Europe, maximum ice-jam levels of the Severnaya

Dvina River at Arkhangel'sk, maximum flood levels of the Dniester River, and of storm runoff based on precipitation for the Dnieper River. Procedures are described for estimating inflow to reservoirs and for using precipitation data in the preparation of operational forecasts. (See W74-05142 thru W74-05145) (Josefson-USGS)
W74-05141

LONG-RANGE FORECAST OF DURATION OF ICE PHENOMENA ON THE DANUBE RIVER (DOLGOSROCHNYY PROGNOZ PRODOLZHITEL'NOSTI LEDOVYKH YAVLENIY NA R. DUNAYE),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2C.
W74-05142

FORECASTING THE MAXIMUM LEVEL OF ICE JAMS ON THE SEVERNAYA DVINA RIVER AT ARKHANGEL'SK (PROGNOZ MAKSIMAL'NOGO ZATORNOGO UROVNYA VODY R. SEVERNOY DVINY U G. ARKHANGEL'SKA),
Godsudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2C.
W74-05144

FORECASTING MAXIMUM FLOOD LEVELS ON THE DNIESTER RIVER (PROGNOZ MAKSIMAL'NYKH PAVODOCHNYKH UROVENY VODY R. DNESTRA),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
G. V. Ardasheva, and R. A. Nezhikhovskiy.
In: Voprosy gidrologicheskikh prognozov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 197, p 84-96, Leningrad, 1972. 3 fig. 5 tab, 10 ref.

Descriptors: *Water levels, *Flood forecasting, Flood routing, Channels, Discharge(Water), Flood discharge, Flood waves, Flood peak, Hydrographs, Hydrograph analysis, Inflow, Equations.
Identifiers: *USSR(Dniester River), Traveltime, Hydrometric stations.

To prepare a forecast of maximum flood levels on the Dniester River at Mogilev-Podol'skiy, Soroki, and Kamenka, a precomputed relation was established between these levels and corresponding maximum stream discharges. The forecast is timed to coincide with the onset of the flood peak at Galich and can be made 3-4 days in advance. (See also W74-05141) (Josefson-USGS)
W74-05145

VEGETATION OF CENTRAL ANATOLIA AND ITS ECOLOGY,
Ankrana Univ. (Turkey). Dept. of Botany.
R. Cetik.
In: Agricultural spects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p. 109-128. 6 fig, 2 tab.

Descriptors: *Vegetation, *Arid climates, *Arid lands, Geomorphology, Grasslands, Orography, Rain, Rainfall, Temperature, Evaporation, Winds, Precipitation(Atmospheric), Rainfall disposition, Snowfall, Plant groupings, Shribs, Riparian plants, Grazing, Grasses.
Identifiers: *Turkey(Anatolia).

The geomorphology of central Anatolia is described as being diverse, with some mountainous regions and intermountain plains. These plains have an arid climate, caused by the deflection of the moisture-bearing winds of Western Anatolia by the surrounding mountains. Temperature distribution in the area is fairly uniform, with significant low temperature extremes in winter and corresponding high temperature extremes in summer months. Winds are associated with annual cycles, often with two predominant directions. Evaporative water loss from the area is found to be from three to four times in excess of the local precipitation. Central Anatolia has a cold and snowy winter, a mild and rainy spring, a less rainy autumn, and a hot and dry summer with a severe arid period. These climatic conditions are mainly responsible for the floral and vegetation of the central plains. Vegetation may be roughly grouped into classes associated with valleys and the steppe. The more moist environment of the valleys lends itself to shrub vegetation, which is thoroughly cataloged, as is the grassland vegetation of the drier steppe. (Muller-Arizona)
W74-05214

INVASION OF SEMIDESERT GRASSLAND BY VELVET MESQUITE AND ASSOCIATED VEGETATION CHANGES,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3F.
W74-05226

RIVERBANKS IMPROVEMENT PROGRAM,
Broome County Planning Dept., Binghampton, N.Y.
For primary bibliographic entry see Field 6F.
W74-05234

EFFECT OF TWO IMPOUNDMENTS ON THE SALINITY AND QUANTITY OF STORED WATERS,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 5B.
W74-05335

WATER REGIME OF SOD PODZOLIC SOILS UNDER SPRUCE FORESTS OF DIFFERENT AGES, (IN RUSSIAN),
V. D. Zelikov.
Sb Rab Mosk Lesotekh Inst. 33, p 113-130. 1970.
Identifiers: Ages, *Forests, Moisture, Porosity, Reserves, *Sod podzolic soils, *Spruce, Water regime, Weather, *USSR(Moscow region).

A survey is presented of the mensurative characteristics of spruce stands, soil morphology and weather conditions on the spruce forests in the Moscow region, USSR. The dynamics of replenishment of groundwaters and of the moisture reserves in the soil under the spruce forests, the characteristics of moisture circulation, the dynamics of moisture available to the plants during the growth period, and the changes of soil porosity under spruce forests of different ages are described.--Copyright 1973, Biological Abstracts, Inc.
W74-05343

THE EFFECT OF METEOROLOGICAL FACTORS ON COMBUSTIBILITY OF GROUND COVER AND A NEW METHOD OF FORECASTING FIRE DANGER IN FORESTS OF THE KAZAKH HILLS (IN RUSSIAN),
M. Z. Musin.
Tr Kaz Nauchno-Issled Inst Lesn Khoz. 7. p 309-314, 1970.
Identifiers: *Combustibility, *Fire danger, Forecasting, *Forests, Grass, Ground cover, Hills, Humidity, Meteorological studies, Pine, Temperature, *USSR(Kazakh Hills).

Investigations were made on the effect of precipitation, temperature, relative humidity, and wind velocity on the humidity and combustibility of the ground cover of dying-off needles in pine forests (site class V, age class VI, density 0.5) on a glade with grass cover. The effect of each factor is evaluated by a 3-mark scale. The complex effect of meteorological factors and the appearance of fire sources on the territory under guard are also evaluated by 3-mark scales. Results are presented of experimental verification of different methods of determination of fire danger under the conditions of the Kazakh Hills, USSR.--Copyright 1973, Biological Abstracts, Inc.
W74-05352

DENSE LOCAL PLANTATIONS OF PINES IN THE NORTHERN KAZAKHSTAN (IN RUSSIAN),
V. A. Dikorov.
Tr Kaz Nauchno-Issled Inst Lesn Khoz. 7. p 213-223, 1970.
Identifiers: Moisture, Nutrition, *Pines, Plantations, *USSR(Kazakhstan).

Studies were conducted on pine plantations established in 1939-1962 by seed sowing and seedling planting on small plots from 0.2-0.3 x 0.2-0.3 to 3 x 3 m on dry stony soils of the hillocky areas and clearings turned into steppe in the Kustanai, Tselinograd and Kokchetav (USSR) regions. Dense plantations, established by sowing were most practical in places requiring much clearing. Nutrition and moisture reserves were utilized by the biological group (stands) more completely than by single trees. With age, the growth of pine in dense biological groups weakened. Optimum density was 3-5 trees/m2 in a dry pine forest. The spacing of plots at distances of 3 x 5, 5 x 5, 4 x 8 m did not result in a stable biocenosis; the size of the plots should not exceed 1 m2, the optimum size being 0.5 x 0.5 m with 1000 plots/ha. Natural root grafting in the biological groups was a frequent phenomenon but it did not affect tree growth.--Copyright 1973, Biological Abstracts, Inc.
W74-05354

STUDIES ON RECLAMATION DIKE AT RIVER MOUTH: METHOD OF FORECASTING DISASTER OCCURRENCE AT LAND RECLAMATION BY MEANS OF ESTIMATING INFLUENCE OF SHAPE OF DIKE AND CONFIGURATION SURROUNDING LAND RECLAMATION AREA (IN JAPANESE),
T. Kusaka, T. Fujiwara, and H. Masumoto.
Bull Fac Agric Yamaguti Univ. 23. p 483-498, 1972, Illus, English summary.
Identifiers: Configuration, Dikes, *Disaster forecasting, *Japan, *Land reclamation Methodology, *Reclamation dikes, Rivers.

Some land reclamation areas studied in Japan were Saga, Kagoshima, Kumamoto, Yamaguchi, Shimane, Tottori and Ibaragi prefectures.--Copyright 1973, Biological Abstracts, Inc.
W74-05355

EQUIVALENT PIPE METHODS FOR OPTIMIZING WATER NETWORKS--FACTS AND FALLACIES,
Roorkee Univ. (India).
For primary bibliographic entry see Field 8A.
W74-05383

THE ECONOMIC EFFICIENCY OF INTER-BASIN AGRICULTURAL WATER TRANSFERS IN UTAH: A MATHEMATICAL PROGRAMMING APPROACH,
Water Research Lab., Logan.
J. E. Keith, J. C. Anderson, and C. G. Clyde.
PRWG100-3, Utah Water Research Laboratory, College of Engineering, Utah State University, Logan, Utah, June 1973. 51 fig, 16 tab, 40 ref, 5 append, 136 p.

Descriptors: *Water supply development, *Economic efficiency, *Inter-basin transfers, *Water allocation(Policy), *Utah, *Agriculture, *Water demand, Computer models, Optimization, Linear programming, Marginal costs, Value, Municipal water, Industrial water, Wetlands, Water requirements, Systems analysis.

Identifiers: *Central Utah Project, Jordan River Basin(Utah).

The efficient allocations of agricultural water in Utah in time frames up to 2020 under several alternative assumptions are examined, and the costs of alternative policies are calculated. Using mathematical programming techniques, a computer model is developed to determine the supply (marginal cost) and demand (value of marginal product) relationships for agricultural water, given depletions for municipal and industrial (M and I) and wetland requirements. The model maximizes net profit per acre to an average agriculturalist in each of ten study areas in Utah. Proposed interbasin transfers and their costs are included in supply. The optimal solution generated is an efficient allocation, since maximization of net profits occurs only when value of marginal product equals marginal cost. Requirements for M and I water are projected into the future, using trending and probable industrial development. Timing of investments in water distribution systems can be determined from the model solutions. Using alternative assumptions about policies, several optional temporal distributions are determined. The effect of restrictions on groundwater pumping is examined. Costs to users in higher supply curves (marginal costs) are approximated by areas between supply curves. Losses to agricultural users from diminished efficient new production can be approximated. The critical factors in large proposed water transfers in Utah appear to be the growth of M and I requirements along the Wasatch Front, particularly in the Jordan River Basin. (Bell-Cornell)
W74-05385

MODELS OF WATER SUPPLY SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
R. G. Cembrowicz.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 157-179 (Chapter 7), 1973. 1 fig, 2 tab, 51 equ, 30 ref.

Descriptors: *Water supply development, Projects, *Design, *Optimization, *Alternative planning, *Mathematical models, Cost-benefit analysis, Linear programming, Networks, Hydraulics, Water distribution(Applied), Water treatment, Systems analysis.
Identifiers: *Cost minimization, Geometric programming, Nonlinear programming, Capacity expansion, Unit processes, Tree networks, Decomposition techniques.

The optimal design of water supply systems is considered, with several specific parts of the overall water supply system treated in detail. Inherent difficulties exist in comparing costs of water supply systems to the benefits of ample and safe supply; the problem of a cost-benefit analysis for water supply projects is discussed. Next, if fresh water is scarce or water demands exceed accessible resources, an investigation of all possible supply alternatives in an entire region becomes necessary. Mathematical programming techniques for selecting different sources and the least-cost combination of alternate sources are considered. Next, the focus is on the optimization of unit processes in a water treatment plant; geometric programming is introduced and applied to the hydraulic design of sedimentation tanks. Then, the economically optimal design of the water distribution system is investigated; discussed is the tree principle, and the transformation of the nonconvex capital cost function of a hydraulic network to subsets of nonlinear convex functions by a decomposition position principle from graph theory is described. Finally, a model for the capacity expansion of a water supply system is presented. (Bell-Cornell)
W74-05394

4B. Groundwater Management

SYSTEMATIC DESIGN OF LEGAL REGULATIONS FOR OPTIMAL SURFACE-GROUNDWATER USAGE--PHASE 1,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux, R. A. Young, and G. E. Radosevich.
Available from National Technical Information Service as PB-228 649 $7.50 in paper copy, $1.45 in microfiche. Colorado State University Environmental Resources Center, Completion Report Series No 53, August 1973, 81 p, 3 fig, 3 tab, 53 ref. OWRR B-076-COLO(2).

Descriptors: Groundwater, *Surface-groundwater relationships, *Regulations, Law, *Optimization, *Water management(Applied), *Conjunctive use.

The purpose is to model the legal restrictions and the hydrologic constraints imposed by conjunctive use, and develop criteria for legal rules that utilize information on aquifer parameters, snowmelt runoff, etc. Legal and institutional methods and limitations concerning the conjunctive and integrated use of ground and surface water resources are examined. Legal schemes developed by the states of Colorado and New Mexico for conjunctive use are discussed, together with a cursory examination of the situations in Texas and California. The doctrine of prior appropriation is discussed in relation to its initial development in the western states for the purpose of controlling the appropriation of surface water to its evolution and modification to control conjunctive use. The Colorado system places more stress upon the concept of establishing some common basis for surface and groundwater rights while the New Mexico procedure makes the existence of one dependent upon the retirement of the other. Both systems are characterized by a singular absence of specific requirements; instead broad regulatory powers are created. California has devised a different solution to integrated use due to its complex dual system of water rights. Texas will be faced with a highly complex situation due to adherence to the English rule that a landowner owns the water under his land and cannot be denied the right to produce his groundwater even if it infringes upon neighboring rights. Western states are finally recognizing the need for integrated use of ground and surface water; the Fellhauer case required the integration of vested rights with maximum utilization.
W74-04853

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, MADISON COUNTY, ALABAMA: WATER RESOURCES,
Geological Survey, University, Ala. Water Resources Div.
K. E. Vanlier, R. C. Christensen, R. J. Faust, and W. F. Harris, Jr.
In: Geological Survey of Alabama Atlas Series 1, p 13-28, 1971. 13 ref.

Descriptors: *Water resources, *Alabama, Groundwater, Surface waters, Urbanization, Karst hydrology, Water demand, Water supply, Geology, Maps.
Identifiers: *Huntsville(Ala).

The demands of the increased population upon the natural resources of Madison County, Alabama, are at an all-time high; so is the volume of waste produced. Informed use of the land, water, and mineral resources, based on scientific facts, is necessary for Alabama's third-largest urban area and its environs. This study has been directed at supplying basic facts about the resources of the area and their conservation to aid in adequate city and urban planning for the future. Water, oil and gas and minerals such as limestone, sand, gravel, and clay for construction are the most important raw materials for industrial development in the area. In general, Alabama has great and unexplored reserves of these resources that are relatively undeveloped. In Madison County, a thick sequence of limestone beds underlie the area. Some of these formations are relatively pure limestone that has been gently folded and fractured. Fracture openings in limestones are enlarged by solution, forming large storage reservoirs underground for water and an extensive labyrinth of channels along which groundwater can move. These groundwater reservoirs, when tapped effectively by wells and managed properly, are capable of supplying many billions of gallons of water to the area to meet its water needs. Wells are an important source of water supply. The yields from these wells range from about 5 to more than 100 gpm. Most wells in the quadrangle supply household needs, which require only a few gallons per minute. Several wells yielding 100 gpm or more are used for industrial, agricultural, and public supply. (Knapp-USGS)
W74-04911

WATER-RESOURCES APPRAISAL OF THE BIG SANDY AREA, MOHAVE COUNTY, ARIZONA,
Geological Survey, Phoenix, Ariz.
E. S. Davidson.
Arizona Water Commission Bulletin 6, December 1973. 40 p, 4 fig, 2 tab, 17 ref.

Descriptors: *Water resources, *Arizona, *Groundwater, *Surface waters, Alluvial channels, Hydrologic data, Hydrogeology, Aquifers, Water yield.
Identifiers: *Big Sandy River(Ariz).

The central valley of the Big Sandy River, Arizona, is underlain by several hundred to a few thousand feet of semiconsolidated to unconsolidated deposits that store large amounts of groundwater; the principal water-yielding units are stream and flood-plain alluvium, the upper basin fill, the lower basin fill, and the arkosic gravel. The depth to groundwater below the land surface ranges from less than 1 foot in places along the Big Sandy River to 750 feet in the northern part of the area. The mean annual precipitation ranges from 10 inches in the central valley to 20 inches in the mountains and is equivalent to about 1 million acre-feet of water in the 1,770-square-mile drainage basin of the Big Sandy River upstream from the granite gorge near Wikieup. About 4.6% of the precipitation leaves the area as surface-water and groundwater outflow; the rest of the precipitation is lost to evaporation or is transpired by vegetation. In general streamflow is intermittent and occurs only in response to precipitation or snowmelt. Groundwater and surface water generally are of good chemical quality except for the high fluoride content. The average surface-water outflow is about 24,900 acre-feet per year. The total groundwater outflow--which comprises evapotranspiration in an area of dense riparian growth, consumptive use for irrigation and public supply, and underflow--is about 21,500 acre-feet per year. Only a few thousand acre-feet of water per year is used by the inhabitants in the area, and the available water resources will support considerable additional development. (Knapp-USGS)
W74-04922

PRACTICAL SIMULATION MODELS OF THE SUBSURFACE HYDROLOGIC SYSTEM WITH EXAMPLE APPLICATIONS,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W74-04973

WORTH OF DATA USED IN DIGITAL-COMPUTER MODELS OF GROUND-WATER BASINS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
J. S. Gates.

Available from the National Technical Information Service as PB-228 854, $15.00 in paper copy, $1.45 in microfiche. Technical Report No. 8, June 1972. 214 p, 11 fig, 16 tab, 40 ref, append. OWRR B-007-ARIZ(26) and A-010-ARIZ(22). 14-01-0001-1876, 14-31-0001-3708.

Descriptors: *Groundwater, *Computer models, Recharge, Statistical models, *Forecasting, Network design, *Risks, *Well data, Pumping.
Identifiers: Bayesian decision theory, Groundwater pumping, Model evaluation, Uncertainty analysis.

The worth of additional data to a digital model of the Tucson basin, Arizona was computed using a basic form of statistical decision theory (Bayesian). The model variables for which additional data were hypothesized included the aquifer coefficients of storage and transmissivity, initial water levels, discharge, and recharge. The worth of data was evaluated in terms of the expected reduction in error in predicted water levels associated with collection of more data on one variable at one point in the model. A limited number of tests suggested that the Tucson basin model could be improved most by obtaining more data on discharge and recharge in areas where these variables were large, and by obtaining more data on transmissivity where it was uncertain. More data on initial water levels and storage coefficient commonly were less helpful. The sensitivity of the results to the assumptions made in postulating discrete frequency distributions with largely subjectively-determined parameters for the model variables was estimated. These tests indicated that the numerical values for worth of data were sensitive to the assumptions, but that the relative rankings of variables in terms of worth of added data remained constant.
W74-04975

AN ANALYSIS OF THE WATER QUALITY PROBLEMS OF THE SAFFORD VALLEY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W74-04976

REASONABLE STATE REGULATION OF THE INTERSTATE TRANSFER OF PERCOLATING WATER,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 4A.
W74-04980

GROUND-WATER RESOURCES OF THE SAN ANTONIO AREA, TEXAS: A PROGRESS REPORT ON STUDIES, 1960-1964,
Geological Survey, Austin, Tex.
S. Garza.
Texas Water Development Board, Report 34. November, 1966. 31 p, 11 fig, 4 tab, 33 ref.

Descriptors: *Aquifer characteristics, *Limestones, Surface-groundwater relationships, Water sources, Water table, Saline water intrusion, Reservoirs, Streams, Wells, *Texas.
Identifiers: *Edwards Aquifer(Tex.), *San Antonio(Tex.), Aquifer head-water movement relationships, Edwards Plateau(Tex.).

This report updates through 1964 hydrologic data on the Edwards and associated limestones, which is the principal ground-water reservoir (aquifer) for the San Antonio area. Records of precipitation, streamflow, and water level are included, as well as estimates of recharge to and discharge from the aquifer. The base flow of the streams that drain the Edwards Plateau is spring flow from a water-table aquifer in the plateau. Recharge is primarily from stream seepage, and through direct infiltration of precipitation on the outcrop of the aquifer. Between 1934-1964, average annual recharge was estimated to be almost 500,000 acre-feet. Most of the 1934-1964 discharge from the aquifer was from springs, exceeded by discharge from wells only between 1954-1957 and 1963-1964. In 1964 discharge from springs was nearly 214,00 acre-feet, while discharge from wells exceeded 267,000 acre-feet. Low water levels prevailed between 1947-1956, due to drought and increased withdrawals from wells throughout the San Antonio area. Recharge from heavy rains between 1957-1961 increased water levels to approximately pre-drought levels. Also included are analyses on the relation of the aquifer head to changes in water movement and storage and a summary of studies on water quality in the zone of transition between water of good quality and saline water in the aquifer. (Hoffman-North Carolina)
W74-04992

FUNDAMENTALS OF KARST SCIENCE. VOLUME 2 (OSNOVY KARSTOVEDENIYA. TOM II),
Perm State Univ. (USSR). Inst. of Karst Studies and Speleology.
For primary bibliographic entry see Field 2F.
W74-05017

PULSE-TEST RESPONSE OF A TWO-ZONE RESERVOIR,
Esso Production Research Co., Houston, Tex.
E. G. Woods.
Society of Petroleum Engineers Journal, Vol 10, No 3, p 245-256, September, 1970. 12 fig, 5 tab, 15 ref.

Descriptors: *Transmissivity, *Storage coefficient, *Aquifer characteristics, *Mathematical models, Diffusivity, Drawdown, Flow Permeability, Porosity.
Identifiers: *Pulse test, *Well pair, *Two-zone reservoir, Cross flow, Skin factor, Buildup.

A mathematical study was undertaken to determine what errors could be caused by interpreting pulse tests in a multi-zone reservoir with a single-layer model. The investigation of the pressure response of two-zone reservoirs indicates the apparent transmissibility obtained by pulse testing is always equal to or greater than the total transmissibility of the zones. Apparent storage is always equal to or less than the total storage of the zones. These apparent zone properties approach total properties as vertical fluid communication between zones increases. The presence of non-uniform wellbore damage in the zones alters the division of flow between zones, and consequently, alters their apparent transmissibility ratio. The flow-rate ratio is a good estimator of the transmissibility ratio of the zone in the absence of wellbore damage. A numerical example is given of the use of a procedure, based on the differences of reservoir properties determined by single-well tests and pulse tests, to describe flow properties of two-zone reservoirs. (Gray-NWWA)
W74-05077

DISSOLVED OXYGEN AND IRON IN SHALLOW WELLS AT SALISBURY, MD.,
Geological Survey, Towson, Md. Water Resources Div.
For primary bibliographic entry see Field 5B.
W74-05078

CHEMICAL ASPECTS OF UNDERGROUND WATER,
Commonwealth Scientific Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
D. J. Swaine.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resource', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 5 p, 4 ref.

Descriptors: Groundwater, *Groundwater movement, *Geochemistry, *Trace elements, Chemical properties, Exploration, Mining, *Water quality, Salinity, Organic wastes, Solid wastes, *Sulfur bacteria, *Australia.
Identifiers: Perth(Aust.), Interstitial water.

The assumption is made that groundwater is a resource which will be used in increasingly large amounts in the future. There is at present insufficient knowledge of the trace-element composition; of the processes determining the composition; and of the causitive physical and chemical processes of underground waters. Discussed in some detail are: Origin of salts in groundwater, reactions between rocks and saline solutions, the relevance of underground waters to mineral exploration, and groundwater in the geochemical cycles of trace elements. Also discussed are processes which if operative could be instrumental in determining groundwater quality, such as the decomposition of organic matter and the action of sulphate-reducing bacteria. (Hunt-NWWA)
W74-05080

PUBLIC CONTROL AND REGULATION,
Melbourne Univ., Parkville (Australia).
For primary bibliographic entry see Field 6E.
W74-05082

GROUNDWATER IN PAPUA NEW GUINEA,
Geological Survey of Papua New Guinea, Port Moresby.
G. Jacobson, and C. H. Kidd.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resource', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 16 p, 6 fig, 1 tab, 8 ref.

Descriptors: *Groundwater, *Aquifer characteristics, Water resources development, Springs, Wells, *Groundwater availability, Dug wells, *Water pollution sources.
Identifiers: *Papua New Guinea, Total dissolved solids, Bacterial contamination.

Groundwater makes a significant contribution to the urban and rural water supplies of Papua New Guinea. Eight hundred water bores and dugwells have been recorded, and there are spring developments throughout the country. Increased future usage of groundwater is necessary because of bacterial contamination of surface waters and the seasonal nature of the rainfall in some areas. Groundwater availability is largely unknown, and the need for reconnaissance surveys and detailed aquifer evaluations is discussed with the aid of a groundwater potential map. Finance is at present a major limiting factor to groundwater development, with government drilling programs appearing to be the only workable solution. (Staplin-NWWA)
W74-05084

PRESSURE INTERFERENCE EFFECTS WITHIN RESERVOIRS AND AQUIFERS,
Standard Oil Co. of California, San Francisco.
T. D. Mueller, and P. A. Witherspoon.
Journal of Petroleum Technology, Vol 17, No 4, p 471-474, April, 1965. 4 fig, 5 ref.

Descriptors: *Aquifers, Groundwater reservoirs, *Diffusivity, *Reservoirs, *Pressure, Flow, Head loss, Theis equation.
Identifiers: *Mortada equation, Point source, Well interference.

The solutions of Theis and of Mortada to the Calculation of pressure conditions within a reservoir or aquifer are reviewed. Graphs were prepared of dimensionless pressure drop vs. dimensionless time for radius ratios from one to infinity to afford solutions to the diffusivity equation for the infinite radial case at constant terminal rate. The Theis, or point source, solution can be used for radius ratios greater than 20, with little error (as shown by ex-

amples). For low radius ratios, the solution of the diffusivity equation given may be preferred. A chart provides a means of determining the order of the errors that will result through the use of the Theis equation. In the calculation of interference effects in an aquifer, a substantial error can occur when the Theis solution is used, although in oil-reservoir calculations the error is often negligible. (Gray-NWWA)
W74-05087

THE SKIN EFFECT IN PRODUCING WELLS,
For primary bibliographic entry see Field 8B.
W74-05088

GROUND WATER SUPPLIES OF NORTHEASTERN ILLINOIS -- QUALITY PROBLEMS WITH WELL WATERS,
Illinois State Water Survey, Urbana. Chemistry Section.
For primary bibliographic entry see Field 5B.
W74-05100

BOREHOLE GEOPHYSICS AS APPLIED TO GROUNDWATER,
Geological Survey, Denver, Colo.
W. S. Keys.
In: Proceedings of the 2nd Annual Water Well Seminar for Professional Engineers, March 22, 1973, Columbia, S.C.: South Carolina Water Resources Commision, p 46-73, 1973. 6 fig, 1 tab.

Descriptors: *Borehole geophysics, *Data collections, Hydrologic data, Hydrogeology, Electrical well logging, Radioactive well logging, Subsurface investigations.

Borehole geophysics or well logging includes all techniques of lowering a sensing device in a well to make a record which may be interpreted in terms of the rock characteristics, contained fluids, and the construction of the well. The single most important factor in the present minor use of geophysical logging in water wells in cost. As a result of recent developments in electronics, small and relatively inexpensive logging units that can be operated by one man are now available. A second basic deterrent to the widespread use of geophysical well logs in groundwater is that few professional geologists, hydrologists, or engineers are working on water well drilling projects. In addition, most drillers, municipal water engineers, or hydrologists do not have the experience necessary to interpret geophysical logs. Therefore interpretation must be provided along with logs, if logging is to have much practical application to the solution of hydrologic problems. (Knapp-USGS)
W74-05118

EVALUATION OF GROUND-WATER DATA,
Geological Survey, Atlanta, Ga.
A. N. Turcan, Jr.
In: Proceedings of the 2nd Annual Water Well Seminar for Professional Engineers, March 22, 1973, Columbia, S.C.: South Carolina Water Resources Commission, p 18-28, 1973. 3 tab, 8 ref.

Descriptors: *Data collections, *Hydrologic data, *Hydrogeology, Water resources development, Planning, Water management(Applied), Conferences, *Groundwater managment.

In design and evaluation of a groundwater data system, thinking must not be limited to one part of the hydrologic system. The line between ground and surface water is indistinct; it is not a line, but a continuum that varies in relation to time and space. Groundwater becomes surface water and vice versa. The hydrologic system is dynamic, thus network design must be flexible and always subject to change based upon the changes in economy, available manpower, and new thrusts or problems, such as storage of waste in the deep zones as well as the shallow zones of the underground part of the system. (Knapp-USGS)
W74-05119

COLLECTION OF GROUNDWATER DATA,
Georgia Inst. of Tech., Atlanta.
P. G. Mayer.
In: Proceedings of the 2nd Annual Water Well Seminar for Professional Engineers, March 22, 1973, Columbia, S.C.: South Carolina Water Resources Commission, p 12-17, 1973.

Descriptors: *Data collections, *Hydrologic data, *Hydrogeology, Water resources development, Planning, Water management(Applied), Conferences, *Groundwater management.

A local data base is needed for groundwater development as well as an appreciation of regional implications that may exist either as limiting to the desired engineering results or as an undesirable consequence of an engineering project. The usual purposes to which engineers and planners address themselves in connection with groundwater resources are water supply wells, infiltration galleries, groundwater recharging wells, and infiltration ponds. In larger industrial developments it may also be necessary to develop groundwater observation wells and groundwater monitoring systems, by means of which the fate of potential pollutants can be monitored and which, in the case of an unforeseen accident, provide the basis for remedial measures. (Knapp-USGS)
W74-05120

GROUNDWATER CONDITIONS OF THE TARAI REGION,
Pant Coll. of Tech., Pantnagar (India).
A. K. Bhar, H. S. Seth, and A. K. Ghosh.
Indian Geohydrology, Vol 9, No 1, p 19-30, June 1973. 1 fig, 3 tab, 6 ref.

Descriptors: *Water balance, *Groundwater, *Water yield, Irrigation water, Infiltration, Discharge(Water), Water resources development, Hydrogeology, Artesian aquifers, Water table.
Identifiers: *India(Tarai region).

In the groundwater of the Tarai region of India, every year a surplus of water accumulates in the upper unconfined aquifers, whereas the inflow to the confined aquifers just balances the outflow from them. This suggests that further exploitation of water from confined aquifers should be stopped at least for the time being, and additional water required for irrigation can be safely tapped from the unconfined aquifers. (Knapp-USGS)
W74-05131

SPACING OF HARD ROCK SHALLOW WELLS,
Osmania Univ., Warangal (India). Regional Engineering Coll.
N. T. Zhdankus.
Indian Geohydrology, Vol 9, No 1, p 1-9, June 1973. 2 fig, 4 ref.

Descriptors: *Water wells, *Water yield, *Hydrogeology, Economics, *Water costs, Hydraulic conductivity, Transmissivity, Data collections.
Identifiers: *India.

Optimum spacing and number of wells depend on hydrogeological conditions. Suitable methods for the determination of optimum spacing of shallow hard rock wells and selection of suitable pumps for them were developed on the basis of hydraulic and economical considerations. Shallow aquifers in hard rock areas of India are characterized by low hydraulic conductivity and transmissivity. Location of each well should be determined individually on the basis of geophysical data and interpretation of local topographical and geological conditions. Sharp variation of productivity of even closely situated wells in hard rock areas shows that hydrogeological parameters of such formations are inconsistent, varying within broad limits without any pronounced order. (Knapp-USGS)
W74-05133

GEOTHERMAL RESOURCE INVESTIGATIONS, IMPERIAL VALLEY, CALIFORNIA: SPECIAL REPORT TEST WELL MESA 6-1.
Bureau of Reclamation, Denver, Colo. Lower Colorado Region.
February 1973. 44 p, 17 fig, 3 photo, 7 tab, 3 ref.

Descriptors: *Geothermal studies, *Water wells, Thermal water, *California, Thermal powerplants, Water yield, Wells.
Identifiers: *Geothermal energy, *Imperial Valley(Calif).

The Bureau of Reclamation and the Office of Saline Water are exploring the geothermal resources under Reclamation-withdrawn lands in Imperial Valley, California. A deep geothermal test well was drilled in Imperial Valley, California. Total depth of 8,030 feet was reached on August 16, 1972. The well began to flow geothermal liquid and steam on August 25, 1972 and flowed for an aggregate total of 66 days to January 24, 1973. A series of temperature, pressure, quality, and flow measurements were made during that period. Surface plumbing facilities, including a separator, silencer, and weir, were installed to separate the steam and liquid and to accurately determine the thermodynamic characteristics of the geothermal fluid. The water is typical geothermal fluid. It is predominantly sodium-potassium and chloride water, with the amount of silica being at the saturation point for the prevailing temperature. In the interval between 2,500-7,150 feet in Mesa 6-1, it would be possible to screen potential producing zones having intergranular permeabilities in excess of 100 millidarcys over an aggregate thickness of 1,232 feet. (Knapp-USGS)
W74-05139

GROUNDWATER RESOURCES OF THE VALE OF CLWYD.
Water Resources Board of England and Wales.
Publication No 20, 1973. 58 p, 32 fig, 10 tab, 15 ref, 3 append.

Descriptors: *Conjunctive use, *Hydrogeology, Aquifer characteristics, Aquifer testing, Water yield, Drawdown, Surface-groundwater relationships, Water balance.
Identifiers: *Wales(Vale of Clwyd).

The hydrogeology of the Vale of Clwyd, Wales, and the relationship between the surface hydrology and groundwater conditions are described. Up to 20,000 cu m per day could be made available by continuous direct supply from boreholes, but any such perennial abstraction would in the long term reduce flows in the river Clwyd; at least 30,000 cu m per day could be made available for supply if the groundwater storage were to be used to regulate the river Clwyd, and such a development would enhance the low flows in summer and autumn over much of the river. (Knapp-USGS)
W74-05168

WATER RESOURCES OUTLOOK FOR THE MINNEAPOLIS-SAINT PAUL METROPOLITAN AREA, MINNESOTA,
Geological Survey, St. Paul, Minn.
R. F. Norvitch, T. G. Ross, and A. Brietkrietz.
Metropolitan Council of the Twin Cities Area, St. Paul, 1973. 219 p, 59 fig, 27 tab, 64 ref, append.

Descriptors: *Groundwater, *Hydrogeology, Aquifer characteristics, *Minnesota, Hydrologic data, Aquifers, Water resources development, Cities, Water management(Applied), Water wells, Water yield, Urbanization.
Identifiers: *St. Paul(Minn), *Minneapolis(Minn).

The water resources of St. Paul and Minneapolis were studied within an area whose natural groundwater flow is largely towards the center of the

metropolitan area. This area coincides with the extent of the Hinckley Sandstone aquifer. Greater emphasis is placed on the area underlain by the Prairie du Chien-Jordan aquifer (about 2,000 square miles), from which approximately 75% of the groundwater for the metropolitan area is pumped. The surface-water resources of the Twin Cities metropolitan area are used to such an extent that a supply adequate for domestic and industrial needs as well as powerplant and sanitary effluent assimilation will not be available during severe drought. Groundwater is obtained primarily from two aquifer systems: The Prairie du Chien-Jordan and the Mount Simon-Hinckley. In 1970, these aquifers supplied about 90% (175 mgd) of the groundwater used in the metropolitan part of the study area. The probable level of development that can be sustained by these two aquifers in the metropolitan area is estimated to be 1,100 mgd; thus, substantial additional groundwater supplied could be developed. However, considerable management and planning would be needed to sustain this level of development. Maps in this report can be used to select general well-field locations based on consideration of (1) aquifer, (2) depth needed for completion, (3) head availability, (4) location of natural recharge and discharge boundaries, and (5) distance from areas where over-development of groundwater resources is imminent. (Knapp-USGS)
W74-05172

SUBSURFACE BIOLOGICAL ACTIVITY IN RELATION TO GROUND WATER POLLUTION,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5B.
W74-05230

GROUNDWATER IN THE NORTHERN WISO BASIN AND ENVIRONS, NORTHERN TERRITORY,
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
M. A. Randal.
Bulletin 123, 1973. 141 p, 23 fig, 1 plate, 15 tab, 65 ref, 7 append.

Descriptors: *Groundwater, *Hydrogeology, *Australia, *Aquifers, Water yield, Geomorphology, Water quality, Groundwater movement.
Identifiers: Wiso Basin(Australia).

Groundwater resources were studied in the northern Wiso Basin in the central part of the Northern Territory of Australia. Because of seasonal and sparse rainfall the surface water resources of the region are meager, and both pastoral and community development are largely dependent on the availability of groundwater of reasonable quality. The region comprises three Palaeozoic basins of mainly carbonate rocks and their surrounding Lower Cambrian and Precambrian basement rocks. From a groundwater point of view the most important of the basement rocks are Lower Cambrian volcanics, which crop out in the west and extend subsurface considerable distances eastward. Most of the groundwater is obtained from the carbonate sequences. Over large parts of the region these sequences are overlain by flat-lying Lower Cretaceous rocks which have a profound effect on the groundwater regime. Geomorphology also is important to the groundwater regime. The region is a gently undulating plateau which slopes northward and is bounded by the dissected country of the main coastal river system; depth to economic quantities of water is governed by the depth below the surface of suitable aquifers, and throughout the plateau these are generally deeper than on its dissected margins. Throughout the entire region the known groundwater reserves are suitable for stock; only in a few places is the quality below domestic standards. The groundwater resources are more than adequate for the present pastoral and community development. Although rainfall is low in the southern parts the probable recharge areas are very large and the withdrawal rate is very low. In the north rainfall is high and recharge situations extensive. (Knapp-USGS)
W74-05331

EXTENSIVE PUMPING FROM UNCONFINED AQUIFERS,
Birmingham Univ., (England). Dept. of Civil Engineering.
K. R. Rushton.
Water Resources Bulletin, Vol 10, No 1, p 32-41, February 1974. 5 fig, 2 tab, 5 ref.

Descriptors: Water resources development, *Water yield, *Groundwater movement, *Numerical analysis, Drawdown, *Withdrawal, Mathematical models, Water table, Recharge, *Pumping.

Heavy pumping of an aquifer to remove a significant proportion of the stored water is considered using a numerical method which permits the analysis of radial flow to a well in an unconfined aquifer and allows for the reduction in the saturated depth. The analysis is restricted to extensive unconfined aquifers of constant thickness which are initially full of water with wells positioned on a square grid. When the aquifer is recharged with the recharge equaling the discharge, it is possible that a steady state will be reached with the heads remaining constant with time. Withdrawal of a large proportion of the available water from an unconfined aquifer requires carefully controlled pumping. If the discharge rate is too high, the pump will quickly run dry and only a very small proportion of the water will be withdrawn. (Knapp-USGS)
W74-05336

4C. Effects On Water Of Man'S Non-Water Activities

EFFECT OF WATERSHED AREA OIL FIELDS ON WATER QUALITY,
Shreveport Dept. of Water and Sewerage, La.
For primary bibliographic entry see Field 5B.
W74-05079

NORTH SLOPE - CONSTRUCTION CRITERIA FOR ROADS AND FACILITIES,
Atlantic Richfield Co., Dallas, Tex.
For primary bibliographic entry see Field 4A.
W74-05104

4D. Watershed Protection

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1971.
Water Resources Council, Washington, D.C. Sedimentation Committee.
For primary bibliographic entry see Field 2J.
W74-04916

COMPARATIVE COSTS OF EROSION AND SEDIMENT CONTROL, CONSTRUCTION ACTIVITIES.
Engineering-Science, Inc., Berkeley, Calif.
Copy available from GPO Sup Doc as EP1.23:430/9-73-016, $2.20; microfiche from NTIS as PB-229 480 $1.45. Environmental Protection Agency, Washington, D.C., Office of Water Program Operations, Report EPA-430/9-73-016, July 1973. 205 p, 60 fig, 140 ref. EPA Contract 68-01-0755.

Descriptors: *Erosion control, *Sediment control, *Comparative costs, *Construction costs, *Soil erosion, *Estimated costs, Erosion rates, Cost analysis, Rainfall intensity, Water pollution, Water pollution sources, Water clarification, Soil conservation, Dredging, Desilting, California, Virginia.
Identifiers: *Universal soil loss equation, Occoquan Creek Basin(Virginia), Walnut Creek Basin(California), Rainfall erodibility index, Debris basins.

Cost information on erosion and sediment control measures was developed for over 25 methods in current widespread use in both the humid Eastern and arid Western United States. Most of the data presented were developed for the Walnut Creek Basin in California and the Occoquan Creek Basin in Virginia, but the detailed cost estimates presented provide a basis for estimating local costs elsewhere for similar control methods using three principal cost elements: labor, equipment and materials. Soil losses were estimated by using the improved universal soil loss equation. The rainfall erosion index in the soil loss equation was intensively studied, and simplified procedures for its computation were developed and presented. Cost data were applied to theoretically-predicted soil losses in both of the selected watersheds to obtain comparative costs per cubic yard of soil retained for conservation measures, and similar costs for various sediment removal methods. Control effectiveness parameters and economic life of each method were used to determine comparable annual cost figures. A central conclusion of the study was that costs of preventing erosion are, in many instances, lower than the direct costs of removing sediments from downstream areas or from water supplied. (EPA)
W74-04986

A SUMMARY REPORT ON THE STUDY OF LAND AND WATER RESOURCES IN NORTHEAST GREENWICH, CONNECTICUT.
Conservation Foundation, Washington, D.C.
Prepared for the Town of Greenwich, Connecticut, May, 1973. 22 p, 14 fig.

Descriptors: *Water supply, *Connecticut, *Conservation, Environmental effects, *Watershed management, Planning, *Water demand, Ecology, Geology, Hydrology, Soils, Connecticut, Urbanization, Zoning, Natural resources.
Identifiers: Open space, *Greenwich(Conn.), Natural processes.

Part of the town of Greenwich which is of vital concern in terms of protection from urban development pressures is the water supply watershed representing most of the remaining open area within the town. The aqueduct from the Mianus River Reservoir in Stamford is the other major source of water. Intended to provide information needed to make recommendations and decisions concerning the use and development of this area, this study focuses on a corridor of wetlands and streams within the watershed and covers bedrock geology, surficial geology, ecology, hydrology, and soils. Emphasis is placed on identifying natural conditions and processes and the interrelationships among these processes or environmental subsystems. The findings of the study are grouped according to those relating to water supply, to water demands, and to the protection of resources. The town's demand for water has increased 50% in the past 10 years and the watershed, especially the central corridor, is a critical element in meeting the demand. It is proposed that in the central corridor area no residential development be allowed on poor soils, on steep slopes, or within 200 feet of streams, lakes, and wetlands. Recommendations include the use of zoning ordinances, the State Inland Wetlands Act, and the Town Plan. (Elfers-North Crolina)
W74-04996

EFFECT OF DIBBLING OF WINTER FALLOW ON HYDROPHYSICAL PROPERTIES OF

FROZEN SOIL AND ON EROSION PROCESSES VLIYANIYE LUNKOVANIYA ZYABI NA VODNO-FIZICHESKIYE SVOYSTVA MERZLOY POCHVY I PROTSESSY EROZII),
For primary bibliographic entry see Field 2G.
W74-05019

EROSION CONTROL AND VEGETATIVE COVER UNDER DRYLAND CONDITIONS IN TURKEY,
Istanbul Univ. (Turkey). Faculty of Forestry.
For primary bibliographic entry see Field 3F.
W74-05220

THE HYDROMETEOROLOGICAL AND ANTIEROSION EFFECT OF FORESTS IN THE EASTERN PART OF THE CENTRAL URALS (IN RUSSIAN),
G. A. Kharitonov.
Lesovedenie. 6. p 14-24, 1970, English summary.
Identifiers: *Erosion control, Forests, Freezing, Management, Meteorological conditions, Runoff, Snow, Soils, *USSR(Central Urals), *Montane forests.

The effect of the montane forests on elements of the local climate along the watersheds and mountain slopes is discussed. The effects on the snow regime, the freezing and defreezing of soil, the surface runoff and the river runoff are described. Indexes of the anti-erosion effect of forest, and silvicultural measures for the intensification of the hydrometeorological effect of forests in the eastern part of the Central Urals, USSR, are presented.--Copyright 1973, Biological Abstracts, Inc.
W74-05353

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

TRACE SOLUABLE ORGANIC COMPOUNDS IN POTABLE WATER SUPPLIES,
Iowa State Univ., Ames. Dept. of Chemistry.
H. J. Svec, J. S. Fritz, and G. V. Calder.
Available from National Technical Information Service as PB-228 523 $4.50 in paper copy, $1.45 in microfiche. Iowa Water Resources Research Institute, Ames, Report ISWRRI - 54, January 1974. 23 p, 2 fig, 3 tab, 11 ref. OWRR A-046-IA(1).

Descriptors: *Organic compounds, Aqueous solutions, *Potable water, *Analytical techniques, Resins, *Solvent extractions, Gas chromatography, *Water analysis, Mass spectometry, Iowa, Nebraska.
Identifiers: Macroreticular resins, *Trace organic analysis.

An analytical method has been developed for concentrating, extracting, separating, and identifying natural organic compounds present in sub parts-per-million quantities in potable water. The developed technology consists of extracting trace organic compounds from water by means of macro-reticular resins, eluting them by simple and rapid solvent methods, separating the mixtures by gas chromotography, and identifying and quantifying the various pollutants by combination gas chromotography mass spectometry. The experimental XAD-2 method was compared to the standard EPA approved solvent extraction method for determining chlorinated pesticides in water and showed it to be more effective, even at parts-per-trillion levels, in recovering dieldren from river water. More than 150 compounds were identified (in about half of these cases even the specific isomer was identified) in the raw and/or treated water from fifteen Iowa and Nebraska communities. In several cases the raw water had fewer contaminants than the treated water. Presumably the additional contamination resulted from contact with treatment equipment or organic coatings (tar or asphalt) used to prevent corrosion of the iron conduits used to transport the water to consumers. (Cecil-Iowa)
W74-04855

SELECTIVE CHROMATOGRAPHIC SEPARATION OF URANIUM(VI) ON DEAE-CELLULOSE LAYERS IN DILUTE ACETIC ACID MEDIA,
Chiba Univ. (Japan). Lab. for Analytical Chemistry.
R. Kuroda, K. Oguma, and H. Watanabe.
Journal of Chromatography, Vol 86, No 1, p 167-172, November 1973. 1 fig, 2 tab, 19 ref.

Descriptors: *Cellulose, *Separation techniques, Ions, Acids, Chromatography, Beryllium, Magnesium, Aluminum, Calcium, Titanium, Chromium, Zinc, Cadmium, Manganese, Iron, Cobalt, Nickel, Copper, Strontium, Lead, Molybdenum, Gold, Mercury, Ion exchange.
Identifiers: *Uranium, *Thin layer chromatography, Acetic acid, DEAE-cellulose, Indium, Vanadium, Gallium, Ruthenium, Scandium, Barium, Yttrium, Thallium, Thorium, Zirconium, Tin, Antimony, Tellurium, Bismuth, Rhodium, Arsenic, Germanium, Columbium, Silver, Tungsten, Iridium, Rhenium, Platinum, Selenium, Elution.

In dilute acetic acid solutions, U(VI) shows a useful chromatographic distribution on DEAE-cellulose layers, while most other metals ions migrate upwards to the solvent front or remain at or near the start. This chromatographic behavior of U(VI) enables a selective method for the separation of U(VI) by thin-layer chromatography to be developed. The R sub f values on DEAE-cellulose and Avicel SF are quoted for 34 metal ions as a function of acetic acid concentration in the range 1-6 M. Results for two- and three-component separations by elution with 1 M acetic acid are given in order to illustrate the effectiveness and utility of the present method. (Mortland-Battelle)
W74-04864

IDENTIFICATION OF AROMATIC NITRILES BY REACTION PAPER CHROMATOGRAPHY,
Vyzkumny Ustav Organickych Syntez, Pardubice (Czechoslovakia).
J. Franc, and K. Pospisilova.
Journal of Chromatography, Vol 86, No 1, p 159-165, November 1973. 1 fig, 2 tab, 8 ref.

Descriptors: *Chromatography, *Aromatic compounds, Acids, *Organic acids, *Pollutant identification, Organic compounds.
Identifiers: *Nitriles, *Paper chromatography, Dinitriles, Diamides, Carboxylic acid, Cyanobenzoic acid, Dicarboxylic acid, Tricarboxylic acid.

A procedure involving reaction paper chromatography for the determination of the number of nitrile groups in molecules from the shift in the R sub M values of the substance before and after reaction has been developed. A technique for the detection of substances with a nitrile group, which can be used with advantage even for other substances, has been devised. To 1 ml of 15-20 percent hydrogen peroxide, 1-2 drops of 15 percent aqueous NaOH solution and several milligrams of a sample of a substance containing a nitrile group were added. The mixture was shaken and filtered after 2-3 min, and the residue on the filter was dissolved in either dimethyl sulphoxide or ethanol. The solution obtained was applied directly on to the chromatographic paper as a 5 percent solution. The substances were chromatographed on Whatman No. 3 paper using n-propanol-ammonia (2:1) as the solvent. The detection was carried out by spraying with two reagents. The first reagent was prepared by mixing 5 g of hydroxylamine hydrochloride with an equivalent amount of anhydrous sodium carbonate and adding 200 ml of 96 percent ethanol. After stirring, the solution was filtered and the filtrate was used for spraying. The second reagent was a saturated aqueous solution of copper(II) acetate. The chromatogram was sprayed with the first reagent and, after drying either freely in the air or in an oven at 80C, it was sprayed with the second reagent. The coloration of the spots was observed immediately under UV light. Some substances fluoresced brightly in various colors, and some were visible even under normal light. (Mortland-Battelle)
W74-04865

INTERFACING A PROGRAMMABLE ELECTRONIC CALCULATOR WITH AN AUTOMATIC AMINO ACID ANALYZER,
Richard B. Russell Agricultural Research Center, Athens, Ga.
M. L. Fishman, L. M. Landgraff, and D. Burdick.
Journal of Chromatography, Vol 86, No 1, p 37-51, November 1973. 5 fig, 10 ref.

Descriptors: *Amino acids, *Chemical analysis, *Data processing, Interfaces, Electronic equipment, Costs, Instrumentation, Automatic control.
Identifiers: *Data interpretation, Automatic amino acid analyzer, Programmable electronic calculator, Chemical recovery, Kjeldahl nitrogen.

The rapid calculation of data from an automatic amino acid analyzer by a programmable electronic calculator is now possible. The programmable electronic calculator offers a less expensive and more flexible alternative to large computers. Typically, data in the form of retention times and peak areas are read from a punched tape and converted into final values with a minimum of data handling. A digital integator, teletypewriter with tape punch and reader, tape editor and printer also are required. A mathematical program is described that has been devised to convert raw data from a 4-h protein hydrolyzate run into final values. The final printout presents in tabular form each amino acid as a percentage of the sample dry weight and crude protein. The total weight percentage of amino acids and percentage recovery of protein based on Kjeldahl nitrogen are also calculated. Other features of the program include the ability to eliminate up to 20 extraneous peaks from the sample and to correct for sampling errors with the aid of internal standards. Amino acid molecular weights and color constants, which are also calculated, are stored without destruction so as to permit the calculation of an unlimited number of samples from the same set of standards. (Holoman-Battelle)
W74-04866

COULOMETRIC DETERMINATION OF IRON(II)-1,10-PHENANTHROLINE WITH CERIUM(IV),
Maryland Univ., College Park. Dept. of Chemistry.
S. W. McClean, and W. C. Purdy.
Analytica Chimica Acta, Vol 67, No 1, p 113-118, November 1973. 2 tab, 8 ref.

Descriptors: *Iron, *Electrochemistry, *Pollutant identification, Methodology, Chemical analysis, *Volumetric analysis, Heavy metals, Electrodes.
Identifiers: *Coulometric titration, Cerium, *Ferroin, Precision, Accuracy, Metal complexes, 1 10-Phenanthroline, Chemical concentration, End-point detection system.

Iron bound to 1,10-phenanthroline (ferroin) was determined by coulometric titration with electrogenerated cerium(IV). Titrations were performed in which generation was stopped from 1 min after about 80 percent of the sample had been titrated. No significant differences were observed between these titrations and those run with no delay. Those iron samples in the range 0.1-130 micrograms were titrated with a relative standard deviation of 0.7-5.0 percent and a relative error of

0-4.0 percent with the greatest inaccuracies and imprecision being at the lower end of the range, where titration times were shortest. The end-point detection system consisted of a platinum and a saturated calomel electrode across which a constant voltage is impressed. This voltage is such that the platinum electrode is 1.025 V vs N.H.E. The current between the indicating electrodes is monitored with a current-sensing device possessing a sensitivity of 0.0001 microA/mm. (Holoman-Battelle)
W74-04867

DETERMINATION OF EIGHT METALS IN THE INTERNATIONAL BIOLOGICAL STANDARD BY FLAMELESS ATOMIC-ABSORPTION SPECTROMETRY,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany).
P. Schramel.
Analytica Chimica Acta, Vol 67, No 1, p 69-77, November 1973. 10 fig, 3 tab, 6 ref.

Descriptors: *Trace elements, Calcium, Potassium, Sodium, Phosphorus, Aluminum, Cadmium, Copper, Chromium, Iron, Manganese, Lead, Sulfur, *Metals, Pollutant identification, *Spectrophotometry.
Identifiers: Flameless atomic absorption spectrophotometry, *Biological samples, Wet ashing, Human tissue, Vanadium, Tissue, Muscle, Plancenta, Sample preparation, Chemical interference.

Flameless atomic-absorption spectrometry was used to measure the concentration of trace elements (Al, Cd, Cr, Cu, Fe, Mn, Pb, and V) in biological material prepared by a wet-ashing procedure. The final wet-ashing procedure, applied in the present work, was as follows: cover 100-150 mg of dry sample with 100 microliters of concentrated sulphuric acid, and heat until fumes of sulphur trioxide appear. Then add dropwise 1.5-2 ml of 50 percent hydrogen peroxide until a clear solution is reached. Cool and dilute to 10 ml with twice-distilled water. Solutions prepared in this way were suitable for all the elements studied. All calibration curves were obtained with 10-microliter amounts of each 'pure' standard solution prepared in 0.18 M sulphuric acid. Subsequently, the effects of the matrix elements, calcium, potassium, sodium, and phosphorus were investigated. The interference of sulphur was taken into consideration by applying a 0.18 M sulphuric acid standard solution. The results showed that there were no interferences for the elements Al, Cd, Cu, Cr, Fe, and Mn; for all these metal ions, the calibration curves found were the same as with 'pure' standard solutions. There are very strong interferences with the absorbance signal in the case of lead. The 'pure' standard solutions of this element gave absorbance signals which were about three times higher than the signals in the case of the IBS matrix. Interferences were less significant in the case of vanadium. The results verified the usefulness and speed of the wet-ashing procedure for destroying biological materials and of the flameless atomic absorption procedure for analyzing particular trace elements in these materials. (Mortland-Battelle)
W74-04868

VOLTAMMETRIC BEHAVIOUR OF COPPER(III) AND ITS ANALYTICAL APPLICATIONS,
Siena Univ. (Italy). Istituto di Chimica Generale.
G. Raspi, P. Zanello, A. Cinquantini, and P. Corti.
Analytica Chimica Acta, Vol 66, No 3, p 435-442, October 1973. 2 fig, 3 tab, 19 ref.

Descriptors: *Copper, *Electrochemistry, *Chemical analysis, Aqueous solutions, Heavy metals, Methodology, Hydrogen ion concentration, Cations, Anions, Pollutant identification.
Identifiers: *Voltammetry, *Metal complexes, *Ligands, Reproducibility, Periodates, Tellurates, Amperometric titration, Ionic interference, Detection limits.

The voltammetric behavior of diperiodatocuprate(III) and ditelluratocuprate(III) complexes was investigated in aqueous solution at a platinum microelectrode for which the diffusion layer was periodically renewed. The voltammetric determination of Cu(II) was also investigated. The copper(II) and copper(III) complexes with periodate or tellurate ligands are electroactive at a smooth platinum electrode, giving an anodic, cathodic or cathanodic wave in the presence of alkaline hydroxide solutions containing copper(II), copper(III), or copper(II)-copper(III) species, respectively. The following analytical applications are proposed: (a) amperometric titration of copper(III) solutions; (b) voltammetric determination of copper. Results of amperometric titrations of copper(III) were similar to those by an established procedure. Voltammetry of copper(II) allows the metal to be determined down to concentrations of 0.00001 M, even in the presence of different ions; the procedure can be applied to such heat-transfer media for nuclear reactors as sodium and potassium metals and their hydroxides. (Holoman-Battelle)
W74-04870

CONFIRMATION OF HEXACHLOROBENZENE BY CHEMICAL REACTION,
Institut National de la Recherche Agronomique, Versailles (France).
B. E. Baker.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 5, p 279-284, November 1973. 4 fig, 4 ref.

Descriptors: *Chemical reactions, *Pollutant identification, *Methodology, Organic compounds, Separation techniques, Chlorinated hydrocarbon pesticides, Fungicides.
Identifiers: *Hexachlorobenzene, Chlorinated hydrocarbons, Lindane, Monoethoxypentachlorobenzene.

When hexachlorobenzene (HCB) is treated with sodium ethoxide, monoethoxypentachlorobenzene is formed. This chemical reaction can be used to identify and confirm the presence of HCB. That this same derivative can be used to identify HCB in the presence of isomers of lindane has been confirmed. A hexane solution of 1 microgram each of HCB and lindane was treated with sodium ethoxide and mixed with water. Sufficient HCl was added to give an acid reaction, the mixture extracted with hexane, dried over sodium sulfate, and analyzed by GC. After heating under reflux for 1 hr, product analysis showed the presence of unreacted HCB, MEPCB, and an unidentified peak X. (Holoman-Battelle)
W74-04871

OXYCHLORDANE RESIDUES IN HUMAN ADIPOSE TISSUE,
Environmental Protection Agency, Perrine, Fla. Primate and Pesticides Effects Lab.
F. J. Biros, and H. F. Enos.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 5, p 257-260, November 1973. 1 fig, 1 tab, 8 ref.

Descriptors: *Pesticide residues, *Gas chromatography, *Mass spectrometry, DDE, DDT, Separation techniques, Monitoring, *Pollutant identification.
Identifiers: *Adipose tissue, *Oxychlordane, Beta-HCH, Biological samples, Heptachlor epoxide, Sample preparation, Thin layer chromatography, Chlordane.

Twenty-seven specimens of adipose tissue collected from post-mortem examinations and therapeutic surgery were analyzed for a series of organochlorine residues by gas and thin-layer chromatography. Results were confirmed using mass and infrared spectral analyses. Two column were employed for gas chromatography: 1.5 percent OV-17/1.95 percent QF-1, RRT subaldrin of oxychlordane, 1.38 at 200 C and 5 percent OV-210 RRT subaldrin of oxychlordane, 1.56 at 180 C. The tissue was extracted with petroleum ether. Results showed the presence of beta-HCH, oxychlordane, p,p'-DDE, o,p'-DDT, p,p'-DDT, and heptachlor epoxide. The occurrence of storage of oxychlordane residues in general population human adipose tissue may indicate consistent previous exposure to chlordane insecticide and/or oxychlordane from many possible sources. (Little-Battelle)
W74-04872

REDESCRIPTION OF MAPPATES PLATAXUS RANGNEKAR (COPEPODA: CALIGIDAE),
Kerala Univ., Trivandrum (India). Dept. of Aquatic Biology and Fisheries.
For primary bibliographic entry see Field 2I.
W74-04877

THE CHARACEAE OF SOUTHEASTERN UNITED STATES,
Rhode Island Univ., Kingston. Dept. of Botany.
M. C. Choudhary, and R. D. Wood.
The American Midland Naturalist, Vol 90, No 2, p 413-446, October 1973. 1 tab, 93 ref.

Descriptors: *Chara, *Chlorophyta, *Southeast U.S., *Speciation, Varieties, *Systematics, Aquatic algae, Marine algae.
Identifiers: *Nitella, Chara vulgaris, Chara canescens, Chara globularis, Chara zeylanica, Chara braunii, Chara fibrosa, Chara hornemannii, Nitella flexilis, Nitella acuminata, Nitella clavata, Nitella cernaua, Nitella capillata, Nitella furcata, Nitella tenuissima, Nitella gracilis, Nitella hyalina, Nitella translucens, Chara globularis var. virgata, Chara globularis var. leptosperma, Nitella clavata var. dilatata, Nitella gracilis var. leptosoma, Nitella gracilis var. asagrayana, Nitella gracilis var. capitellata.

A study was made of characeae of the 10 southeastern states based upon preserved and herbarium specimens. The findings are compiled in a floristic report containing a key to species, notes on each species and variety - a brief synonymy, list of published records, sources of illustrations and exsiccatae and remarks on the taxa. The Characeae of the Southeast comprise two genera, Chara and Nitella, and 17 species which represent a large proportion of the three genera and 22 species treated for North America. The frequency of occurrence of Characeae was 5 percent, far lower than the 19 percent in Fiji and 28 percent in Australia. A new taxon, N. flexilis var. americana, from Florida, resembles N. flexilis but has distinct mueus. Taxa newly reported for the region are C. globularis var. virgata, var. leptosperma, N. clavata var. dilatata, and N. gracilis var. leptosoma and var. asagrayana. Particular attention is paid to the infraspecific variation of C. zeylanica, and a number of varieties and forms previously recorded from other areas were found to be represented in the Southeast. Mohr's (1884) unusual collections from Mobile were re-examined, and for the most part the original identifications were confirmed. (Holoman-Battelle)
W74-04879

TAXONOMY, DISTRIBUTION AND ECOLOGY OF THE GENUS SESARMA (CRUSTACEA, DECAPODA, GRAPSIDAE) IN EASTERN NORTH AMERICA, WITH SPECIAL REFERENCE TO FLORIDA,
Smithsonian Tropical Research Inst., Balboa, Canal Zone.
For primary bibliographic entry see Field 2I.
W74-04880

SCANNING ELECTRON MICROSCOPY OF BACTERIAL COLONIES,
Agricultural Research Service, Peoria, Ill. Northern Regional Research Lab.
E. G. Afrikian, G. St. Julian, and L. A. Bulla, Jr.

Applied Microbiology, Vol 26, No 6, p 934-937, December 1973. 3 fig, 14 ref.

Descriptors: *Pollutant identification, *Cytological studies, Methodology, Electron microscopy, Cultures, Bacteria.
Identifiers: *Scanning electron microscopy, *Bacterial colonies, Reproducibility, Sample preparation, Culturing techniques, Bacillus cereus, Bacillus subtilis, Bacillus cereus var. mycoides, Culture media.

A technique is described for observing bacterial colony growth. Bacillus cereus, B. subtilis, and B. cereus var. mycoides were grown on strips of dialysis membrane layered on nutrient agar. Microcolonies of the organisms on strips were fixed in Formalin vapor in situ; the strips then were removed from the agar and secured to scanning microscope specimen stubs without markedly disturbing the cellular arrangement. Scanning electron micrographs clearly depict morphology of individual cells, as well as the spatial orientation of cells within the colony. This technique is reproducible, adaptable, and simple. (Holoman-Battelle)
W74-04885

RECOVERY AND IDENTIFICATION OF ANAEROBES: A SYSTEM SUITABLE FOR THE ROUTINE CLINICAL LABORATORY,
Columbia-Presbyterian Medical Center, New York. Diagnostic Microbiology Service.
P. D. Ellner, P. A. Granato, and C. B. May.
Applied Microbiology, Vol 26, No 6, p 904-913, December 1973. 4 fig, 8 tab, 16 ref.

Descriptors: *Anaerobic bacteria, *Pathogenic bacteria, *Pollutant identification, *Isolation, Methodology, Laboratory tests, Antibiotics(Pesticides).
Identifiers: Culture media, *Culturing techniques, *Recovery, Selective media, Gas liquid chromatography, Gram-negative bacteria, Gram-positive bacteria, Clostridium cadaveris, Clostridium histolyticum, Clostridium lentoputrescens, Clostridium subterminale, Clostridium tetani, Clostridium cochlearium, Body fluids, Blood, Biochemical tests, Bacteroides serpens, Bacteroides spp, Drug resistance, Fusobacterium nucleatum, Fusobacterium spp, Eubacterium spp, Arachnia propionica, Peptococcus magnus.

A system is described in which clinical specimens to be cultured for anaerobes are plated on reducible media and incubated in Gas Pak jars for 24 h. Clinical specimens were carfully selected for culture using this system. Generally those specimens originating from body sites harboring normal commensal flora were not cultured. Several experimental formulations of the prereduced anaerobically sterilized (PRAS) transport media were compared with Amies transport medium without charcoal. Using Clostridium novyi B, no significant advantage was observed with the experimental media over Amies medium. Selective and nonselective formulations of reducible media were used for primary isolation. The isolates were identified according to the Gram stain of the pure chopped meat glucose (CMG) culture in combination with gas-liquid chromatography. Pure, undiluted 24-h CMG culture was used to inoculate anaerobic blood agar (anBAP) for antibiotic susceptibility testing. Antibiotic disks of penicillin, ampicillin, carbenicillin, chloramphenicol, tetracycline, erythromycin and clindamycin were used. The methods have been tested in a high-volume routine microbiology laboratory (more than 700 specimens per day), but are also suitable for smaller laboratories. The system permits improved recovery and identification of the majority of anaerobes within a time period commensurate with clinical practice. Preliminary reports with presumptive identification are often available within 48 h, and the final report with complete identification and antibiogram is usually available within 4 days. (Holoman-Battelle)
W74-04886

METHOD FOR RADIORESPIROMETRIC DETECTION OF BACTERIA IN PURE CULTURE AND IN BLOOD,
Biospherics, Inc., Rockville, Md.
J. R. Schrot, W. C. Hess, and G. V. Levin.
Applied Microbiology, Vol 26, No 6, p 867-873, December 1973. 6 fig, 2 tab, 21 ref.

Descriptors: Methodology, *Bacteria, *Pollutant identification, *Radioactivity techniques, Testing procedures, Laboratory tests, Laboratory equipment, Carbon radioisotopes, Instrumentation, Time, E. coli, *Cultures, Streptococcus, Detergents.
Identifiers: Pure cultures, *Blood, *Radiorespirometry, Trace levels, Carbon dioxide evolution, Culture media, Body fluids, Biological samples, Pseudomonas aeruginosa, Klebsiolla, Staphylococcus aureus, Salmonella paratyphi B, Salmonella typhi, Salmonella dysenterae, Haemophilus aphrophilua,Enterobacter aerogenes, Serratia marcescens, Proteus vulgaris, Cardiobacterium, Rhozyme, Triton X-100.

Methods are described for the detection of low numbers of bacteria by monitoring C-1402 evolved from C-14-labeled substrates. Cell suspensions are filtered with membrane filters, and the filter is then moistened with 0.1 ml of labeled medium in a small, closed apparatus. Evolved C-1402 is collected with Ba(OH)2-moistened filter pads and assayed with conventional radioactivity counting equipment. The kinetics of C-1402 evolution are shown for several species of bacteria. Fewer than 100 colony-forming units of most species tested were detected in 2 h or less. Bacteria were inoculated into blood and the mixture was treated to lyse the blood cells. The suspension was filtered and the filter was placed in a small volume of labeled medium. The evolved C-1402 was trapped and counted. A key development in the methodology was finding that an aqueous solution of Rhozyme and Triton X-100 produced lysis of blood but was not detrimental to bacteria. (Holoman-Battelle)
W74-04887

UREASE ACTIVITY OF ENTEROBACTERIACEAE: WHICH MEDIUM TO CHOOSE,
Ghent Rijksuniversiteit (Belgium). Lab. for Pharmaceutical Microbiology.
A. Vuye, and J. Pijck.
Applied Microbiology, Vol 26, No 6, p 850-854, December 1973. 1 fig, 4 tab, 11 ref.

Descriptors: *Pollutant identification, *Enteric bacteria, Coliforms, Shigella, Salmonella, Aerobic bacteria, Pathogenic bacteria.
Identifiers: *Culture media, *Urease, *Biosynthesis, *Selective media, Biochemical characteristics, Enzyme activity, Solid media, Liquid media, Biological samples, Proteus spp, Yersinia, Escherichia, Edwardsiella, Arizona, Citrobacter, Klebsiella pneumoniae, Klebsiella ozoenae, Klebsiella rhinoscleromatis, Enterobacter cloacae, Enterobacter aerogenes, Enterobacter hafniae, Enterobacter liquefaciens, Pectobacterium, Serratia, Providencia, Elek medium, Christensen urea agar, Fecal coliforms, Stuart media, Proteus mirabilis.

Detection and intensity of urease activity in enterobacteriaceae greatly varies as a function of the media or techniques used, or both. A comparative investigation on several solid and liquid media led to the following conclusions. (1) Detection of Proteus spp. can be adequately performed with the highly selective solid medium described by Cook (1948), as well as with the different liquid media described (Stuart standard and rapid media; Elek medium). (2) Detection of Klebsiella should be based upon urease production on solid media with low buffer capacity (Christensen, 1964). (3) For the identification of Yersinia, either the solid Christensen urea agar or the rapid Elek technique gives optimal results. (Holoman-Battelle)
W74-04888

ESTIMATING THE DENSITY OF INDIVIDUAL BACTERIAL POPULATIONS INTRODUCED INTO NATURAL ECOSYSTEMS,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
S. K. A. Danso, M. Habte, and M. Alexander.
Canadian Journal of Microbiology, Vol 19, No 11, p 1450-1451, November 1973. 2 fig, 1 ref.

Descriptors: *Bacteria, *Soils, *Cultures, Ecosystems, Growth rates, Inhibitors, Antibiotics(Pesticides), Pollutant identification, Methodology, Cultures, Measurement.
Identifiers: Xanthomonas campestris, Erwinia carotovora, Rhizobium trifolii, Rhizobium meliloti, Mutants, Streptomycin, Neomycin, Polymyxin, Penicillin, Tetracycline, Chloramphenicol, Crystal violet, Congo red, Culture media.

The abundance of individual strains of Xanthomonas, Erwinia, and Rhizobium added to soil was determined by a method that allows for the enumeration of surviving cells on the introduced population in the presence of many other soil microorganisms. The method should be useful for measuring numbers of other bacteria in heterogeneous communities. The method involves using mutants of the species of interest which are resistant to antibacterial agents that prevent the growth of nearly all other populations in the environment. The bacteria used were Xanthomonas campestris, Erwinia carotovora, Rhizobium trifolii, and Rhizobium meliloti. Streptomycin was selected as the chemical of choice since Rhizobium mutants could be obtained easily by growing the cultures in yeast extract - mannitol broth containing about 50 micrograms streptomycin sulfate/ml and transferring the survivors to the same medium containing higher antibiotic concentrations. By these means, isolates resistant to 1000 micrograms streptomycin sulfate/ml were obtained. Spontaneous mutants of X. campestris and E. carotovora were obtained by inoculating large numbers of the cells into trypticase soy broth containing 800 micrograms streptomycin sulfate/ml, incubating the broth until growth was observed, plating the suspension on a solid medium of the same composition. It should not be too difficult to obtain mutants of other species which grow in media containing antibacterial compounds in concentrations sufficiently high to prevent the replication of large percentages of the residents of natural ecosystems. (Mortland-Battelle)
W74-04890

THE EFFECT OF THYROXINE AND TRIIODOTHYRONINE ON BACTERIAL GROWTH,
Bar-Ilan Univ., Ramat Gan (Israel). Dept. of Life Sciences.
N. Garber, and B. Lupowitz-Donenfeld.
Canadian Journal of Microbiology, Vol 19, No 11, p 1401-1405, November 1973. 7 fig, 21 ref.

Descriptors: E. coli, *Growth rates, *Bacteria, Pseudomonas, Salmonella, Streptococcus, Bioindicators, Cultures, Iron, Calcium, Chelation, Turbidity, Inhibitors, Separation techniques, Isolation.
Identifiers: *Thyroxine, *Triiodothyronine, EDTA, Hormones, Bacillus cereus, Bacillus licheniformis, Streptococcus faecalis, Staphylococcus albus, Serratia marcescens, Shigella boydii, Pseudomonas aeruginosa, Salmonella typhi, Aerobacter aerogenes, Potassium iodide, Differential media, Gram-negative bacteria, Gram-positive bacteria, Bacterial physiology.

The effects of L-thyroxine, D-thyroxine, and 3,5,3'-triiodothyronine on the growth of several Gram-positive and Gram-negative bacteria were examined. The first two compounds, at a concentration of 0.000077 M, were found to have a considerable inhibitory effect while 3,5,3'-triiodothyronine had a very weak effect on the growth of the Gram-positive bacteria examined.

The growth of the Gram-negative bacteria was not inhibited under the same conditions. Potassium iodide, at the same concentration, was not inhibitory. Release of free iodine from the thyroxine preparation was also excluded as contributing to the thyroxine effect because it was shown to be less toxic than thyroxine for Bacillus cereus 569 and to exhibit a similar inhibitory effect on Gram-positive and Gram-negative bacteria. The inhibition of Gram-positive bacteria by L-thyroxine was reduced by cations such as Mn(2 plus), Fe(2 plus), and Ca(2 plus). However, the hormones were more potent in their effect compared to EDTA in the same molar concentration and the inhibition exerted by them was not so easily abolished by the divalent cations as it was in the case of EDTA. Although chelation could contribute to the inhibition of the bacteria by the iodinated hormones, it seems that it is not the only factor involved. (Mortland-Battelle)
W74-04891

METHOD FOR ROUTINE CULTURING OF STRICT ANAEROBIC BACTERIA,
Pretoria Univ. (South Africa). Dept. of Microbiology.
L. van Wyk.
Laboratory Practice, Vol 22, No 11, p 681, November 1973. 6 ref.

Descriptors: *Anaerobic bacteria, *Cultures, Incubation.
Identifiers: Agars, Reazurin, Inoculation, Slant cultures, Sample preservation, Culture media, Sample preparation, Culturing techniques.

Routine culturing of marine anaerobes is accomplished by adding 4 ml anaerobic medium to McCartney bottles previously gassed with a CO2, N2, and H2 mixture. The tightly stoppered bottles are sterilized at 121C for 15 minutes and cooled in a slanted position. The bottles are then filled with a sterile semisolid agar containing 0.15 g washed agar, 0.0001 g reazurin, 2.5 ml reducing solution, and 100 ml distilled water. This agar together with rubber-lined metal caps, protects the slant culture from air, and the indicator shows if the medium becomes too oxidized to permit growth of the anaerobes. Inoculation of the slants can be carried out with a platinum loop in a stream of sterile CO2 without air ever coming into direct contact with the grown medium. By this method cultures of anaerobic bacteria from sheep rumen were effortlessly maintained. After initial incubation at 38C for 48 hr, cultures were stored at 4C for 60 d, whereupon transfers were successfully made to fresh anaerobic slants. Slides for gram stains were easily prepared from these slant cultures. Since the preparation of media is time consuming, a large number of McCartney bottles may be simultaneously prepared as described and stored at 4C until required without marked changes in the medium taking place. (Mortland-Battelle)
W74-04894

LIPOPOLYSACCHARIDE FROM A GRAM-NEGATIVE MARINE BACTERIUM,
Providence Coll., R.I. Dept. of Biology.
A. Mongillo, K. Deloge, D. Pereira, and G. P. O'Leary.
Journal of Bacteriology, Vol 117, No 1, p 327-328, January 1974. 1 tab, 18 ref.

Descriptors: *Marine bacteria, *Lipids, Sands, Sea water, Cultures, Nutrients, Sodium chloride, Centrifugation, Chromatography, *Rhode Island.
Identifiers: *Lipopolysaccharides, Lipid A, Pseudomonads, *Narragansett Bay(R.I.), Paper chromatography.

To investigate the occurrence of marine lipopolysaccharides, a number of marine microorganisms were isolated from sand and seawater collected from Narragansett Bay, Rhode Island. Upon initial screening, one organism was chosen for analysis. Cultural and biochemical characteristics indicated that the organism was a nonmotile pseudomonad. The organism was routinely cultivated at room temperature with constant shaking in a medium containing 5.0 g of nutrient broth, 8.0 g of yeast extract, and the complete salts solution per liter of distilled water. The organism was grown for 24 hr, harvested by centrifugation, washed in complete salt solution, and extracted by the phenol-salts method. The material isolated from this marine pseudomonad as lipid A showed many of the characteristics of other lipid A molecules: it contained glucosamine, and phosphate; its solubility in lipid solvents such as chloroform indicated the presence of fatty acids; and the two hexoses present, glucose and galactose, are also commonly found in the polysaccharide portion of the LPS molecule. Absent from the preparation was the heptose monosaccharide. The absence of the core could indicate that this pseudomonad may only produce an incomplete LPS. Another possibility is that the proper concentration of cations were not present during the extraction to hold the core portion intact. The organism does, however, possess a type of lipopolysaccharide molecule. (Mortland-Battelle)
W74-04896

THE ESTIMATION OF RELATIVE POTENCY FROM TWO PARABOLAS IN SYMMETRIC BIOASSAYS,
Edinburgh Univ. (Scotland). Dept. of Statistics.
D. A. Williams.
Biometrics, Vol 29, No 4, p 695-700, December 1973. 2 tab, 3 ref.

Descriptors: *Estimating, *Statistical methods, Equations, *Bioassay, Lethal limit, Mathematical studies.
Identifiers: Symmetric bioassay, *Relative potency, Mean square error, Parabolas.

Three estimators of relative potency from two parabolas in symmetric bioassays, the estimator proposed by Elston (1965), the maximum likelihood (ML) estimator, and the usual estimator assuming linearity, are compared. The results of a simulation study indicate that in well designed assays Elston's estimator performs at least as well as the other two estimators, whether or not the log-dose response regression is linear. (Holoman-Battelle)
W74-04899

AN APPRAISAL OF IDENTIFICATION METHODS FOR PENICILLIUM SPECIES: NOVEL TAXONOMIC CRITERIA BASED ON TEMPERATURE AND WATER RELATIONS,
Commonwealth Scientific and Industrial Research Organization, North Ryde (Australia). Div. of Food Research.
J. I. Pitt.
Mycologia, Vol 65, No 5, p 1135-1157, September/October 1973. 1 fig, 6 tab, 22 ref.

Descriptors: *Cultures, *Speciation, *Fungi, Systematics, Temperature, Pollutant identification, Methodology.
Identifiers: *Culture media, *Water activity, *Penicillium, Eupenicillium, Paecilomyces, Talaromyces.

Examination of media and methods currently used in Penicillium taxonomy led to the conclusion that by using only two media, Czapek yeast autolysate agar and malt extract agar, and by incubating cultures at 25C for 7 days, one could obtain classical taxonomic data with optimal efficiency. The effect of reduced water activity and reduced and elevated temperatures on the growth of Penicillium spp. accepted in the Raper and Thom A Manual of the Penicillia was studied. On a glycerol-nitrate salts agar of 0.93 water activity, and on Czapek yeast autolysate agar at 5C and 37C, extent of growth after 7 days provided taxonomically valuable data; within-species variation was low, while between-species variation was sufficiently marked to assist in determinative classification. Moreover, water relations, as assessed by the above technique, showed a very high correlation with penicillus type in some Sections of the genus. (Little-Battelle)
W74-04902

IMPROVED PH CONTROL OF FUNGAL CULTURE MEDIA,
National Research Council of Canada, Saskatoon, (Saskatchewan). Prairie Regional Lab.
J. J. Child, C. Knapp, and D. E. Eveleigh.
Mycologia, Vol 65, No 5, p 1078-1086, September/October 1973. 1 fig, 4 tab, 14 ref.

Descriptors: *Fungi, *Hydrogen ion concentration, *Growth rates, Phosphates.
Identifiers: *Culture media, Aspergillus midulans, Penicillium patulum, Claviceps, Sporulation, Allomyces arbusculus, Aspergillus fonsecaeus, Chaetomium funicola, Coprinus comatus, Geotrichum candidum, Neurospora crassa, Penicillium chrysogenum, Pythium acanthicum, Rhizopus sexualis, Saccharomyces cerevisiae, Sordaria funicola, Ustilago maydis, Zygorhynchus.

A number of fungi grew well in the presence of relatively high concentrations (40 millimoles) of phosphate and MES (2-(N-morpholino) ethane sulfonic acid) buffers at either pH 5.5 or 7.0. In certain instances better growth and sporulation were observed than that found using more conventional growth media (malt, Czapek-Dox) that lack any marked buffering capacity. EMTA (3,6-endomethylene-1,2,3,6-tetrahydro-cisphthalic acid) could be used as a buffer for fungal culture media with certain species only. As good growth and no major change in chemical composition occurred, these buffers are recommended for use in high concentration to eliminate pH variation in comparative physiological studies. Fungal strains used were: Allomyces arbusculus, Aspergillus fonsecaeus, Chaetomium funicola, Claviceps sp., Coprinus comatus, Geotrichum candidum, Pythium acanthicum, Rhizopus sexualis, Saccharomyces cerevisiae, Sordaria funicola, Ustilago maydis, and Zygorhynchus sp. (Little-Battelle)
W74-04903

COMPOSITION AND WASTE LOAD OF UNIT EFFLUENTS FROM A COMMERCIAL LEAFY GREENS CANNING OPERATION,
Georgia Univ., Experiment. Div. of Food Science.
W. A. Bough.
Journal of Milk and Food Technology, Vol 36, No 11, p 547-553, November 1973. 1 fig, 7 tab, 14 ref.

Descriptors: *Effluents, *Canneries, *Waste identification, Acidity, Chemical oxygen demand, Biochemical oxygen demand, Suspended solids, Dissolved solids, Hydrogen ion concentration, Waste disposal, *Pollutant identification.
Identifiers: *Vegetables, Characterization, Settleable solids, Effluent standards.

Analysis of data on composite waste loads from canning of collard, turnip, mustard, spinach, and kale greens revealed no significant differences among the five types of greens. For unit effluents from the dunker washers, reel washers, and blancher, significant differences were found for solids load and total acidity. The most concentrated effluent was from the tumbler fillers. The average composite waste load for all leafy greens was 20.2 plus or minus 5.7 lb/ton COD, 8.5 plus or minus 2.8 lb/ton BOD, 2.8 plus or minus 1.2 lb/ton suspended solids, and 2,666 plus or minus 427 gal/ton waste water. These values are less than one-half of those previously reported for wastes from spinach greens. These results suggest possibly improvement for inplant control of waste from leafy greens, and may also be relevant to the setting of effluent standards for the fruit and vegetable industry. (Mortland-Battelle)
W74-04904

MULTIPURPOSE MEDIUM FOR USE WITH PSEUDOMONAS SPECIES,
Boston City Hospital, Mass. Channing Lab.
S. L. Rosenthal.
Applied Microbiology, Vol 26, No 6, p 1013-1014, December 1973. 1 tab, 3 ref.

Descriptors: *Pseudomonas, *Pollutant identification, *Testing procedures, Denitrification, Hydrolysis, Cultures, Aerobic bacteria, Methodology.
Identifiers: *Culture media, *Biochemical characteristics, Chemical composition, Substrate utilization, Gelatinase, Starch, Acinetobacter, Pseudomonas aeruginosa, Pseudomonas maltophilia, Pseudomonas cepacia, Pseudomonas putida, Pseudomonas pseudoalcaligenes, Pseudomonas alcaligenes, Pseudomonas marginata, Pseudomonas stutzeri, Pseudomonas acidovorans, Pseudomonas diminuta, Pseudomonas fluorescens, Pseudomonas mendocina, Pseudomonas testosteroni.

A medium consisting of the following can be used to detect starch hydrolysis, gelatinase production, and denitrification by pseudomonads: yeast extract (Difco) 5 g; KNO3, 5 g; K2HPO4, 1 g; gelatin, 4 g; soluble starch, 2 g; agar (Difco), 15 g; water, 1,000 ml. Fifty-eight Pseudomonas strains were grown on the medium. The identity of P. aeruginosa was confirmed by the presence of the characteristic odor and pigments and by the possession of acetamide deaminase. The requirement for methionine as a growth factor served as a confirmatory test for P. maltophilia. The remaining species were identified by a battery of 14 single carbon source assimilation tests. All strains grew rapidly and well on the medium. Forty-nine Acinetobacter strains were also tried. All grew well aerobically and had either positive or negative tests for gelatinase. None grew anaerobically. (Holoman-Battelle)
W74-04906

ISOLATION AND CHARACTERIZATION OF A THERMOTOLERANT METHANOL-UTILIZING YEAST,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
D. W. Levine, and C. L. Cooney.
Applied Microbiology, Vol 26, No 6, p 982-990, December 1973. 5 fig, 3 tab, 17 ref.

Descriptors: *Isolation, *Pollutant identification, *Cytological studies, *Biological properties, Yeasts, Soil fungi, Growth rates, Toxicity, Heat resistance, Organic compounds, Soil microorganisms, Temperature, Proteins, Amino acids, Methodology, Chemical analysis.
Identifiers: *Methanol, Characterization, *Hansenula polymorpha, Ascomycetes, Substrate utilization, Growth media, Chemical composition, Continuous cultures, Culture media, Nucleic acids, Rats.

A yeast capable of growth on methanol as its sole carbon-energy source was isolated from soil samples and identified as a strain of Hansenula polymorpha. A continuous enrichment culture at 37C with a simple mineral salts medium was used to select this organism. The isolate, designated DL-1, has a maximal specific growth rate of 0.22 per h, at pH 4.5 to 5.5 and temperatures of 37 to 42C, in simple mineral salts medium with methanol (0.5 percent), biotin, and thiamine. Growth occurred in a chemostat at temperatures up to 50C, with strong growth at 45C. The maximal growth yield of the yeast on methanol was 0.36 g of dry cell weight per g of methanol, and the yield on oxygen was 0.37 g of dry cell weight per g of O2. Protein content of the isolate is 46 percent, and total nucleic acid content varies from 5.0 to 7.0 percent with increasing growth rate from 0.08 to 0.20 per h. The amino acid profile of this yeast protein indicated that it could serve as a good source of food protein. Feeding studies with rats show the yeast to have no toxic effects. (Holoman-Battelle)
W74-04907

IDENTIFICATION OF BACTERIA BY COMPUTER: GENERAL ASPECTS AND PERSPECTIVES,
Central Public Health Lab., London (England).
National Collection of Type Cultures.
S. P. Lapage, S. Bascomb, W. R. Willcox, and M. A. Curtis.
Journal of General Microbiology, Vol 77, No 2, p 273-290, August 1973. 1 fig, 7 tab, 26 ref.

Descriptors: *Aerobic bacteria, *Numerical analysis, *Computer programs, *Enteric bacteria, Probability, Statistical methods, Laboratory tests, E. coli, Pathogenic bacteria, Coliforms, Shigella, Pseudomonas, Pollutant identification.
Identifiers: Salmonella typhi, Moraxella, Citrobacter, Chromobacterium violaceum, Pasteurella, Gram-negative bacteria.

A probability method for identification of bacteria is discussed. Gram-negative, rod-shaped bacteria were chosen as a model and a table (matrix) was constructed which contained the estimated probabilities of a positive result in each test for each taxon. The results of tests on an unknown strain were compared with the stored probabilities and the likelihood that the strain belonged to each of the matrix taxa was calculated in turn by multiplication of the relevant probabilities. These likelihoods were normalized and the value for each taxon referred to as the identification score for that taxon. This procedure was applied to reference strains and to freshly isolated strains (field strains) from various medical diagnostic bacteriological laboratories. The resulting data were used to improve the matrix, investigate the number of tests needed for identification, estimate test differences between laboratories and for test selection strategies. The matrix was stored in a computer in which all calculations were carried out. Identification rates for fermentative bacteria of 90.8 percent for reference strains and 89.4 percent for field strains were obtained, and for nonfermentative bacteria of 82.1 percent and 70.8 percent respectively. The field strains were received because they were difficult to identify in the medical diagnostic laboratory; higher rates of identification might be expected for typical strains. (See also W74-04910) (Mortland-Battelle)
W74-04909

IDENTIFICATION OF BACTERIA BY COMPUTER: IDENTIFICATION OF REFERENCE STRAINS,
Central Public Health Lab., London (England).
National Collection of Type Cultures.
S. Bascomb, S. P. Lapage, M. A. Curtis, and W. R. Willcox.
Journal of General Microbiology, Vol 77, No 2, p 291-315, August 1973. 5 tab, 178 ref.

Descriptors: *Pollutant identification, *Numerical analysis, *Computer programs, *Enteric bacteria, E. coli, Salmonella, Shigella, Analytical techniques, Laboratory tests, Aerobic bacteria, Pathogenic bacteria, Proteins.
Identifiers: Klebsiella, Gram-negative bacteria.

The results of the identification of 1079 reference strains of Gram-negative, aerobic, rod-shaped bacteria by the probabilistic method in a computer are given. Comparison of identification by conventional methods and by computer showed that 90.8 percent of fermentative and 82.1 percent of nonfermentative strains could be identified on the best available probability matrix. Many of these strains were typical and had caused difficulty in identification in the medical diagnostic laboratory. The implications of various factors in successful computer identification are discussed and the results are given for each taxon by genus and species. (See also W74-04909) (Mortland-Battelle)
W74-04910

REPORT ON THE COMPOSITION OF OIL FROM THE REGION OF NEW HYDROCARBON UPWELLING IN THE SANTA BARBARA CHANNEL,
California Univ., Santa Barbara. Marine Science Inst.
P. G. Mikolaj.
Available from NTIS, Springfield, Va. 22151 Com73-11613; Price $2.75 printed copy; $1.45 microfiche. Report, August 1973. 9 p, 8 fig, 2 tab, 9 ref.

Descriptors: *Oil spills, *California, *Gas chromatography, *Trace elements, Provenance, *Pollutant identification, Chemical analysis, Oil fields.
Identifiers: *Santa Barbara Channel(Calif).

Oil from the area of new hydrocarbon upwelling in the Santa Barbara Channel was analyzed by gas chromatography and characterized by trace elements. The chemical composition of oil from the new area of hydrocarbon upwelling is significantly different from oil originating at the nearshore natural seeps in the vicinity of Coal Oil Point. Compared to oil from the Coal Oil Point region, the new seep oil contains approximately one-half the concentration of nickel and vanadium. Oil from Coal Oil Point is highly naphthenic, while oil from the new seep contains significant amounts of normal paraffins out to carbon number 30 and beyond. Oil from the new seepage area is generally similar to oils produced from the Sisquoc and Monterey formations of the Santa Barbara Channel. The site of the new hydrocarbon upwelling is located in the middle of an area where, during the period 1946 to 1947, previous oil and gas seeps of natural origin were reported. (Knapp-USGS)
W74-04919

ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE--SUMMARY OF EIGHTH MEETING, JUNE 5-7, 1973, PORTLAND OREGON.
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 7C.
W74-04924

A STUDY OF THE RELIABILITY OF CONTINUOUS WATER QUALITY MONITORING,
Tennessee Univ., Knoxville. Water Resources Research Center.
P. E. Davis.
Available from the National Technical Information Service as PB-228 872, $6.00 in paper copy, $1.45 in microfiche. Research Report No. 36, 1973. 51 p, 7 fig, 4 tab, 5 ref, append. OWRR A-022-TENN(1).

Descriptors: *Water quality, *Monitoring, *Tennessee, *Reservoirs, *Forecasting, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Conductivity, Hydrologic data, Streamflow.
Identifiers: *Fort Loudoun Reservoir(Tenn).

An investigation was made of the reliability of continuous water quality monitoring on Fort Loudoun Reservoir. Two continuous monitoring systems were used, and the parameters of temperature, dissolved oxygen, pH, and conductivity were considered. Manual cross sectioning was used to determine the various values in the stream. At both stations, the data taken from the monitor was found to provide an accurate prediction of the conditions of the stream. A comparison of samples taken at the pumps and at the monitors showed that no appreciable change in any of the parameters was induced by the intake systems.
W74-04982

MIGRATION OF ELEMENTS IN RIVER WATERS (MIGRATSIYA ELEMENTOV V RECHNYKH VODAKH),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 5B.
W74-05022

DEVELOPMENT AND FLIGHT TEST OF THE MULTICHANNEL OCEAN COLOR SENSOR (MOCS),
TRW Systems Group, Redondo Beach, Calif.
For primary bibliographic entry see Field 7B.
W74-05026

A BIOASSAY COMPROMISE,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W74-05045

BIOMASS MONITORING OF ALGAL CULTURES BY FLUORIMETRIC MEASUREMENT OF THEIR CHLOROPHYLL CONTENT,
Swedish Water and Air Pollution Research Lab., Stockholm.
For primary bibliographic entry see Field 5C.
W74-05055

DISSOLVED OXYGEN AND IRON IN SHALLOW WELLS AT SALISBURY, MD.,
Geological Survey, Towson, Md. Water Resources Div.
For primary bibliographic entry see Field 5B.
W74-05078

CHEMICAL ASPECTS OF UNDERGROUND WATER,
Commonwealth Scientific Industrial Research Organization, North Ryde (Australia). Div. of Mineralogy.
For primary bibliographic entry see Field 4B.
W74-05080

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT, (HEALTH AND SAFETY LABORATORY, AEC, NEW YORK),
Health and Safety Lab. (AEC), New York.
E. P. Hardy, Jr.
Available from NTIS, Springfield, Va., as Rept. HASL-276. $7.60 per copy, $1.45 microfiche. Report HASL-276, Oct. 1973. 176 p, 8 fig, 38 tab, 90 ref, 5 append.

Descriptors: *Radioactivity, *Fallout, *Monitoring, Measurement, *Strontium, Radioisotopes, Sampling, Milk, Water, Food chains, Public health, Forests, Forest soils, Vegetation, Ranges, Diets, Toxicity, Data collections.
Identifiers: *Iridium, *Plutonium, New York City, San Francisco.

Current data are presented from the HASL Fallout Program; The National Center for Atmospheric Research in Boulder, Colorado; The National Radiation Laboratory in New Zealand; and the EURATOM Joint Nuclear Research Centre at Ispra, Italy. Interpretive reports and notes are included on the global deposition of Sr-90 through 1972, sulfate concentrations in the lower stratosphere, global fallout in a forest compared with an open field, and detection of Ir-192 from recent nuclear tests in the southern hemisphere. Extensive tabulations of radionuclide levels in fallout, surface air, stratospheric air, milk, diet, and tap water are included. A bibliography of recent publications related to radionuclide studies is also presented. (See also W74-05175) (Houser-ORNL)
W74-05174

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT - JUNE 1, 1973, THROUGH SEPTEMBER 1, 1973, APPENDIX,
Health and Safety Lab. (AEC), New York.
E. P. Hardy, Jr.
Available from NTIS, Springfield, Va., as Rept. No. HASL-276, Append. $10.60 per copy, $1.45 microfiche. Report No. HASL-276-Appendix, Oct. 1, 1973. 459 p, 5 append.

Descriptors: *Radioactivity, *Fallout, *Monitoring, Measurement, *Strontium, Radioisotopes, Sampling, Milk, Water, Food chains, Public health, Forests, Soils, Ranges, Diets, Toxicity, Data collections, Data processing, Data storage and retrieval, Data transmissions.
Identifiers: *Iridium, *Plutonium.

There are 35 monthly monitoring sites in the United States and 90 in other countries. A map showing the sites is presented. To facilitate the accurate storage, retrieval and handling of the data generated from the monthly fallout collection network, all data have been transcribed to punched cards. To accomplish this transcription several rigid criteria were applied to the data. One condition was that only monthly data were punched onto the cards. The data printed out from the punched cards are presented in tables. Data are given on the following: (A) Sr-90 and Sr-89 in Monthly Deposition at World Land Sites; (B) Radionuclides and Lead in Surface Air; (C) Radiostrontium in Milk and Tap Water; (D) Table of Conversion Factors; (E) Table of Radionuclides. (See also W74-05174) (Houser-ORNL)
W74-05175

LOW-LEVEL RADIOACTIVITY MEASUREMENTS,
National Bureau of Standards, Washington, D.C.
J. M. R. Hutchinson, W. B. Mann, and R. W. Perkins.
Nuclear Instruments and Methods, Vol. 112, p 305-318, 1973. 16 fig, 7 tab, 20 ref.

Descriptors: *Radioactivity, *Measurements, *Assay, *Water pollution, *Measuring instruments, Equipment, Research and development, Monitoring, Radioactive waste, Biological control, Ion transport, Nuclear explosions, Nuclear powerplants, Effluents, Radioisotopes, Public health, Meteorology.

Low-level radioactivity measurements are reviewed. Alpha- and beta-particle, and Gamma-ray low-level-radioactivity counting is discussed, and various detector systems are compared for detection sensitivity. Low-level measurements on bovine liver standard reference material, and radioactive contamination in industrial samples of aluminum, copper, and steel are reviewed. The results of low-level radioactivity intercomparisons are discussed. Intercomparison studies are made from separate sea-water samples and spiked samples from Lake Michigan. (Houser-ORNL)
W74-05178

RADIONUCLIDE BIOMAGNIFICATION IN COASTAL-PLAIN DEER,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 5B.
W74-05189

A PROPOSED MECHANISM FOR THE RECYCLING OF RADIOCESIUM IN FLORIDA SOIL PLANT SYSTEMS,
Florida Univ., Gainesville. Dept. of Botany.
J. F. Gamble.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 133-139, (1971) 1 fig, 3 tab, 26 ref.

Descriptors: *Cesium, *Recycling, Ecology, *Radioecology, Absorption, Milk, Fallout, *Ecosystems, *Florida, Cycles, Cycling nutrients, Food chains, Soils, Fertility, Nutrients, Forests, Radioactive tracers, Tracking techniques, *Path of pollutants.

Cesium-137 levels in Florida milk samples are five to six times higher than the United States average. There is no evidence to suggest that Florida has received unusually high amounts of fallout. The elevated levels are attributed to ecological concentration factors. Preliminary data of ecosystem compartments, part of a larger, detailed program, indicate that the mechanism responsible for the high, continued Cs-137 activity in the Florida biosphere is a combination of cycling within the plant vascular system and a mycorrhizal-plant root association that transfers nutrients directly from litter to the plant. The efficiency of the recycling is enhanced by the low natural fertility of the soils. The nature of the recycling is such that losses of cesium occur primarily in the fruit. In certain grazing situations, higher levels in beef and milk can be explained by the ingestion of palmetto fronds, palmetto berries, and acorns. A Cs-134 tracer study is described, and data are presented for Cs-137 levels found in selected soil and plant compartments from a sand pine-scrub oak community (Pinus clausa-Quercus chapmanii, Q. geminata, Q. myrtiflora) and from a mixed hardwood stand in north central Florida. (See also W74-05181) (Houser-ORNL)
W74-05192

CYCLING OF STABLE CESIUM IN A DESERT ECOYSTEM,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 5B.
W74-05195

FLUORIMETRIC METHOD FOR THE DETERMINATION OF URANIUM IN NATURAL WATERS,
Geological Survey of Sweden, Stockholm.
A. Danielsson, B. Ronnholm, L.-E. Kjellstrom, and F. Ingman.
Talanta. Vol 20, No 2, p 185-192, 1973. Illus.
Identifiers: *Fluorometric methods, Natural waters, *Uranium, *Ion exchange, *Pollutant identification, Organic matter.

A method is described for the fluorimetric determination of U in natural waters. The limit is 0.3 ppm. Ion-exchange is used to preconcentrate the U by a factor of 22 and separate it from quenching ions in the sample. The fluorescence is measured in a medium that is 1.35 M in both sulfuric and phosphoric acids. The uranyl ions are excited by radiation of wavelength 280 nm and bandwidth 40 nm. The emitted signal is scanned from 470-510 nm. After spiking of the sample solution with a small volume of standard U solution, the fluorescence signal is scanned again and the U content of the sample calculated from the 2 readings. The coefficient of variation is 8.5% for determinations of U in a synthetic water sample having a U content of 1.9 ppm. Destruction of organic matter in the eluates gives 0.1 ppm detection limit.--Copyright 1973, Biological Abstracts, Inc.
W74-05240

NEW ULTRAVIOLET RATIO SPECTROPHOTOMETRIC SYSTEM FOR THE DETERMINATION OF TRACE AMOUNTS OF PHENOLIC COMPOUNDS,
Villanova Univ., Pa. Dept. of Chemistry.
J. E. Fountaine, P. B. Joshipura, P. N. Keliher, and J. D. Johnson.
Analytical Chemistry, Vol 46, No 1, p 62-66, Jan 1974. 3 tab, 5 fig, 23 ref.

Descriptors: *Analytical techniques, *Water analysis, *Phenols, *Pollutant identification,

Spectrophotometry, Ultraviolet radiation, Alkalinity, Colorimetry, Color reactions.
Identifiers: Bathochromic shift, ASTM standards, Aminoantipyrine, Cresols, Thymol, Resorcinol, Tyrosine, Microanalysis, Trace analysis.

A newly developed instrument is described which uses two conventional sealed hollow cathode lamps to monitor the UV bathochromic shift that occurs when phenolic compounds are alkalized. This UV ratio spectrophotometer has been used to determine ppb amounts of phenol, o- and p-cresols, resorcinol, thymol, p-methoxyphenol, tyrosine, and similar phenolic derivatives. The UV ratio method generally gives results that are higher than those obtained in colorimetry with 4-aminoantipyrine (ASTM Standard Method D-1783-70), because para-blocked phenols do not react with 4-aminoantipyrine. Among other advantages of the new method is the relatively small sample size required, viz., 50 ml, compared to the 500 ml demanded by the ASTM procedure. (Brown-IPC)
W74-05244

PCB RESIDUES IN PLANKTON FROM THE GULF OF ST. LAWRENCE,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
D. M. Ware, and R. F. Addison.
Nature, Vol 246, No 5434, p 519-521, Dec. 21/28, 1973. 1 fig, 1 tab, 12 ref.

Descriptors: *Plankton, *Polychlorinated biphenyls, *Pollutant identification, *Particle size, Air pollution, Sea water, Water pollution, Sampling, Aquatic microorganisms, Diatoms, *Canada, Atlantic Ocean.
Identifiers: Prince Edward Island, Nova Scotia, *Gulf of St. Lawrence.

Concentrations of polychlorinated biphenyls (PCB) found in nine standard-net samples of plankta, collected at 10-day intervals from June to Aug. 1972 about 16 km offshore from the northern coast of Prince Edward Island, were found to be inversely related to particle size. This trend persisted despite a 34-fold difference in residue levels between composite samples, indicating that contaminant acquisition is directly proportional to particle surface area. However, spatial and temporal variations in contaminant supply tend to alter the PCB concentratiion vs. particle size relationship. Evidence indicated that PCB are transported from the atmosphere to the sea surface and thence to a plankton. (Brown-IPC)
W74-05256

NEW MEASURING METHODS FOR EVALUATING WASTE WATER QUALITY (NEUERE MESSVERFAHREN ZUR BEURTEILUNG DER ABWASSERQUALITAET),
Herzberger Papierfabrik Ludwig Osthushenrich K.G., Herzberg am Harz (West Germany).
E. Petermann.
Das Papier, Vol 26, No 10A, p 628-631, 635-637, Oct. 1972. 2 fig, 26 ref. English summary.

Descriptors: *Water quality control, Water analysis, Analytical techniques, Waste water(Pollution), *Pollutant identification, *Oxygen demand, *Suspended solids, *Color, *Oily water, Oil pollution, *Pulp wastes, Oil spills, Automation, Pesticides, Chemical oxygen demand, Biochemical oxygen demand, Colorimetry, Monitoring, Effluents, Pulp and paper industry.
Identifiers: Biocides, Permanganate number test.

Methods in use by the pulp and paper industry to evaluate the quality (or polluting effect) of effluent waters are critically assessed, and the need for additional methods is pointed out. Oxygen demand is being evaluated by 5-day BOD, COD, and permanganate number. In addition, most mill effluents are being tested for settleable solids, undissolved (suspended) solids, color, and oil content. The possibilities of automating various test methods are discussed. Disturbances in the 5-day BOD determination caused by the presence of biocides are pointed out. (Wise-IPC)
W74-05259

'BAROVIBRA' BOD MEASURING APPARATUS (BAROVIBRA-BSB-MESSGERAET),
K. Muehleisen.
Der Papiermacher, Vol 22, No 1, p 10-11, Jan. 20, 1973. 4 fig.

Descriptors: *Biochemical oxygen demand, Equipment, *Monitoring, *Industrial wastes, *Instrumentation, Measurement, Waste water(Pollution), *Pollutant identification.
Identifiers: Barovibra BOD monitor.

A highly automated electric instrument for measuring the BOD of effluent samples is described. The apparatus is especially suited for monitoring of industrial waste waters. It is easy to operate and gives reasonably accurate results in a short time. Typical data obtained are given and compared with those derived by other methods. (Speckhard-IPC)
W74-05265

ISOLATION AND CHEMICAL IDENTIFICATION OF TOXIC COMPONENTS OF KRAFT MILL WASTES,
Fisheries Research Board of Canada, West Vancouver (British Columbia). Pacific Environment Inst.
I. H. Rogers.
Pulp and Paper Magazine of Canada, Vol 74, No 9, p 111-116 (Technical Paper T303), Sept. 1973. 4 fig, 5 tab, 18 ref.

Descriptors: *Pulp wastes, *Bleaching wastes, *Pollutant identification, *Toxicity, *Bioassay, Fish, Analytical methods, *Ion exchange, Resins, Cations, Heavy metals, Iron, Copper, Zinc, Chromium, Chlorine, Salmon, *Sockeye salmon, Effluents, Industrial wastes, Water pollution sources, Pulp and paper industry.
Identifiers: Veratrole, Kraft mills, Chlorine compounds, Dehydroabietic acid, Fatty acids, Carboxylic acids, Resin acids.

Toxic organic compounds were isolated from effluents of a bleached kraft mill by a new method, using Amberlite XAD-2 and DEAE-SEPHADEX A-25 ion-exchange resin columns from which organic solutes could be recovered without chemical changes. Bioassays on isolates of different history showed that the mortality of fish (sockeye salmon) was related to the resin acid content of effluents. Resin acids were toxic to young salmon at 2 ppm concentrations in static assays. Dehydroabietic acid was used as a standard reference compound, because of its superior chemical stability. Neutral fractions were nontoxic. Separation of a toxic fraction into its fatty acid and resin acid components indicated that both were toxic. The only chlorinated compound detected was trichloroveratrole (in minor yield). Heavy metals, such as Fe, Cu, Zn, and Cr, made negligible contributions to effluent toxicity. (Brown-IPC)
W74-05270

THE ROLE OF PAPER MILL ADDITIVES AS POTENTIAL STREAM POLLUTANTS -- DEVELOPMENT OF NUCLEAR TECHNIQUES,
Washington State Univ., Pullman. Coll. of Engineering Research Div.
J. C. Sheppard, G. S. Clifton, and G. A. Grant.
Available from the National Technical Information Service as RLO-2221-T3-3, $4.00 in paper copy, $1.45 in microfiche. Research Report No 73/18/6. February 1, 1973. 33 p, 1 tab, 15 fig, 4 ref. RP 1111, AEC contract AT(45-1)-2221 Task 3.

Descriptors: *Pulp and paper industry, *Radioactivity techniques, *Monitoring, *Additives, Chemicals, Analytical techniques, Pollution abatement, *Water pollution sources, *Neutron activation analysis, Radioisotopes, Tracers, Pigments, Beryllium, Zinc radioisotopes, Titanium, Waterproofing, Polymers, Carbon radioisotopes, Microscopy, Tagging, Trace elements.
Identifiers: Coulomb scattering, Rutherford scattering, Americium, Californium, Zinc oxide, Titanium dioxide, Aquapel, Kymene, Alkyl letene dimers, Sizing agents, Wet strength agents, Waterproofing agents, Microtome sectioning, Pulp mills, Paper mills, Papermaking.

The technique of tagging paper additives with metal ions and complexes was found to have serious limitations. Some additives, such as Kymene (a polyamide-epichlorohydrin wet-strength resin) and Aquapel (an alkyl ketene dimer derived from long-chain fatty acids, used as waterproofing and sizing agent), are sufficiently important to papermaking and pollution control to warrant studying their behavior by tagging with carbon-14. Microtome sectioning plus neutron activation was shown to be a powerful tool in determinations of additive distributions in papers. Another technique of potential utility involves Rutherford or coulomb scattering of charged particles from the paper surface. Neutron activation was used to determine the fate of titanium dioxide and zinc oxide fillers or pigments under actual industrial conditions in a paper mill. This method, too, has considerable utility for observing the path of trace metals in paper mill environments. Such studies will help pulp mills in minimizing the loss of costly chemicals and, simultaneously, the discharge of harmful pollutants. A 30-curie neutron source of americium-241 plus beryllium was shown to have limited use in paper mill experiments. However, a higher-flux source of californium-252 may have potential process-control applications, such as the in-line monitoring of clay and titanium dioxide concentrations. (Brown-IPC)
W74-05287

SPECTROPHOTOMETRIC DETERMINATION OF LOW LEVELS OF MONO-, DI-, AND TRIETHYLENE GLYCOLS IN SURFACE WATERS,
Laboratory of the Government Chemist, London (England). Dept. of Trade and Industry.
W. H. Evans, and A. Dennis.
The Analyst (Journal of the Society for Analytical Chemistry), Vol 98, No 1172, p 782-791, Nov 1973. 6 tab, 23 ref.

Descriptors: *Water analysis, *Pollutant identification, *Alcohols, *Carbohydrates, *Organic compounds, Analytical techniques, Oxidation, Spectroscopy, *Spectrophotometry, Color, Colorimetry.
Identifiers: Glycols, Aldehydes, Ethylene glycol.

The method described involves oxidation of glycols to aldehydes with acidified potassium permanganate solution, followed by reaction with 3-methylbenzothiazol-2-one hydrazone to produce green cationic chromogens which are then measured spectrophotometrically at 630 nm. Omitting the oxidation step gives blank samples to compensate for natural interferences. With glycol recoveries of 1-5 mg/liter at precisions of plus or minus 7% from several water samples, the method was sensitive to 0.5 mg glycol/liter. A more sensitive variation of the method for monoethylene glycol alone is also described. (Brown-IPC)
W74-05290

THE QUANTITATIVE DETERMINATION OF CHROMIUM IN URINE BY FLAMELESS ATOMIC ABSORPTION SPECTROSCOPY,
Erlangen-Nuremberg Univ. (West Germany).
K. H. Schaller, H.-G. Essing, H. Valentine, and G. Schacke.
Atomic Absorption Newsletter, Vol 12, No 6, p 147-150, November-December 1973. 3 fig, 2 tab, 18 ref.

Descriptors: *Chemical analysis, *Urine, *Chromium, Methodology, Heavy metals, Pollutant identification, Reliability, Trace elements, *Spectrophotometry.
Identifiers: *Body fluids, Flameless atomic absorption spectrophotometry, Biological samples, Chemical recovery, Precision, Detection limits, Absorbance.

Flameless atomic absorption spectrophotometry is considered to be the most suitable method for the determination of chromium in body fluids. This method has been applied to the direct determination of the chromium content of urine. Fifty microliters of a 24-hr urine sample are injected into an electrically heated graphite tube and the determination made at 358 nm. No prior sample preparation is required. To check the accuracy of the method, 5 micrograms/l Cr was added to urine samples not previously exposed to chromium. The median recovery was 93 percent. To determine precision in a series, one urine sample was analyzed twenty times. With a median chromium concentration of 6.02 micrograms/l and a standard deviation of 0.9 microgram/l, the coefficient of variation was equal to 15 percent. The precision from day-to-day, over the course of one week, expressed as the coefficient of variation was 17 percent at the 6-microgram/l level. The detection limit (equivalent to 1 percent absorption) was 0.2 microgram/l chromium in urine using a sample quantity of 50 microliters, equivalent to 10 pg of chromium absolute. (Holoman-Battelle)
W74-05291

A REVIEW OF WATER ANALYSIS BY ATOMIC ABSORPTION,
Perkin-Elmer Corp., Norwalk, Conn.
R. D. Ediger.
Atomic Absorption Newsletter, Vol 12, No 6, p 151-157, November-December 1973. 88 ref.

Descriptors: *Water analysis, Methodology, *Heavy metals, *Alkaline earth metals, *Alkali metals, *Reviews, Pollutant identification, *Chemical analysis, Filtration, Water sampling, Trace elements, Aluminum, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Surface waters, Sodium, Zinc, *Spectrophotometry.
Identifiers: Atomic absorption, Spectrophotometry, Natural waters, Sample preparation, Sample preservation, Sample storage, Preconcentration, Direct flame atomization, Graphite furnace, Delves cup method, Gaseous hydrides, Arsenic, Selenium, Thallium, Tin, Vanadium, Silver, Detection limits.

A review is presented of the analysis of water samples by atomic absorption. A brief summary of preservation and storage methods is presented, along with information on some of the more useful concentration methods and specialized atomization techniques. Each element of major interest in water quality analysis is considered separately and typical analytical procedures are discussed. (Holoman-Battelle)
W74-05292

A TECHNIQUE FOR EXTRACTION AND STORAGE OF WATER SAMPLES FOR MN, CD, AND PB DETERMINATION BY ATOMIC ABSORPTION SPECTROSCOPY,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
R. D. Olsen, and M. R. Sommerfeld.
Atomic Abosorption Newsletter, Vol 12, No 6, p 165-166, November/December 1973. 1 tab, 7 ref.

Descriptors: *Solvent extractions, *Manganese, *Cadmium, *Lead, Methodology, Chemical analysis, Water analysis, Trace elements, Stability, Heavy metals, Separation techniques, Cobalt, Chromium, Copper, Iron, Nickel, Zinc, *Spectrophotometry.
Identifiers: *Metal chelates, Atomic absorption spectrophotometry, Sample storage, Methyl isobutyl ketone.

A method has been developed for stabilizing metal chelates thus allowing extracted metals to be stored for at least 2 weeks at room temperature in an acetone-HCl solution. The stability is attained when the metal chelates are transferred from methyl isobutyl ketone to the acetone-HCl solution. Other limited tests indicate that Co, Cr, Cu, Fe, Ni, and Zn may also be coextracted and stored in acetone-HCl with similar stability. Some signal enhancement associated with MIBK solutions is also retained with the acetone-HCl solution. This technique should permit greater time flexibility in atomic absorption analysis involving multi-element organic extractions of large numbers of water samples. (Holoman-Battelle)
W74-05293

PYROGRAPHIC ANALYSIS OF WASTE WATERS,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
I, Lysyj.
Environmental Science and Technology, Vol 8, No 1, p 31-34, January 1974. 3 fig, 2 tab, 2 ref.

Descriptors: *Water analysis, *Monitoring, Waste water(Pollution), Mathematical studies, Gas chromatography, Organic matter, Statistical methods, Computer programs, Industrial wastes, Water quality, Water pollution, Degradation(Decomposition), Textiles, Pulp wastes, Poultry, Streams, Waste identification, Water pollution sources.
Identifiers: *Pyrographic analysis, Pattern recognition, Thermal decomposition, Pyrolysis, Characterization.

Based on the theory of multicomponent pattern recognition and differentiation, a new analytical approach represents a fundamental departure from the traditional working concept of analytical chemistry. Multicomponent pattern recognition permits definition of a complex chemical composition as a separate entity, and provides means for studying its interactions with other compositions found in environmental matrices. In the pyrographic method, organic matter is subjected to elevated temperatures in the absence of oxygen, leading to thermal decomposition of organic molecules into several preferential fragments. The nature and quantity of such fragments reflect the elemental and structural character of the parent material. Through identification of the pyrolytically produced derivative composition by means of gas chromatography, the nature of the parent material can be defined. By comparing pyrograms of unknown matter with that of known materials, the qualitative nature of the substance in question could be determined. Analysis of water samples is performed automatically. No sample preparation, such as extraction or separation, is required. Interpretation of data is aided by two computer programs. The technique has been studied and evaluated in waste source identification and differentiation, industrial effluent analysis, control of waste treatment process, characterization of organic content of natural waters, and process control in beer brewing and other fields. Its use for stream monitoring, industrial effluent analysis, and waste treatment control are discussed. (Mortland-Battelle)
W74-05294

ATRAZINE, PROPACHLOR, AND DIAZINON RESIDUES ON SMALL AGRICULTURAL WATERSHEDS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W74-05295

PHOSPHATES IN SEDIMENTS OF PAMLICO ESTUARY,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
J. B. Upchurch, J. K. Edzwald, and C. R. O'Melia.
Environmental Science and Technology, Vol 8 No 1, p 56-58, January 1974. 6 fig, 14 ref.

Descriptors: *Phosphates, *Bottom sediments, *Phosphorus, Freshwater, *Estuarine environment, Mixing, Saline water-freshwater interfaces, Methodology, Inflow, Estuaries, Chemical analysis, Bottom sampling, Aquatic environment, Suspended solids, *North Carolina, Suspension, Sediment transport.
Identifiers: *Pamlico Estuary(N.C.), Pamlico River, Sample preparation.

Of concern is the amount of available phosphorus present in the bottom sediments of North Carolina's Pamlico Estuary along the length of the estuary from a freshwater to an estuarine environment. Bottom sediments were collected at 23 sites from the middle of the Pamlico River with an Ekman dredge. The sediments were frozen, thawed, mixed, dried in an oven at 110 C for 24 hr, and ground. A modified HCl-H2SO4 extraction procedure was used to extract the available phosphorus from the sediments. After extraction the phosphorus was measured using the vanadomolybdophosphoric acid colorimetric method. The amount of 'available' phosphorus extracted from sediment samples along the 35-mile length of the Pamlico Estuary, was observed to decrease from 1.6 mg P/g sediment in freshwater to 0.3 mg P/g sediment in water with a salinity of 18 ppt. A high correlation (r equals 0.99) between available phosphorus and oxalate-extractable iron was found in the upper reach of the estuary (salinity less than 1 ppt). In the lower part of the estuary the Fe-P correlation decreased (r equal 0.86). The decrease in the available P and in the Fe-P correlation along the length of the estuary is consistent with the suggestion that P is held to suspended sediments by some type of Fe-inorganic P complex of limited stability. Suspended materials entering the estuary in the freshwater inflow could lose phosphorus to solution as they are transported through waters of increasing salinity to the mouth of the estuary. (Holoman-Battelle)
W74-05296

MINICOMPUTERS' ROLE IN MONITORING,
Digital Equipment Corp., Maynard, Mass.
R. J. Epler.
Environmental Science and Technology, Vol 8 No 1, p 28-30, January 1974. 1 fig, 1 tab.

Descriptors: *Digital computers, *Data processing, *Monitoring, *Water pollution, *Water quality, Pollutant identification, Automation, X-ray fluorescence, Nuclear magnetic resonance, Instrumentation, Thermal pollution, Radioactive wastes, Magnetic resonance, Water temperature, Hydrogen ion concentration, Electrical conductance, Dissolved oxygen, Oxidation-reduction potential, Gas chromatography, Spectrophotometry, Data collections.
Identifiers: Minicomputers, Analog to digital converters, Microwave spectroscopy.

Many analytical techniques suitable for use in pollutant monitoring lend themselves to use with computers: X-ray fluorescence, microwave spectroscopy, and nuclear magnetic resonance (nmr). Other instrumentation, too, can be used effectively in conjunction with computers. Much of the instrumentation used to monitor pollution can be tied to a computer through appropriate interfacing. Suppose a system is needed to monitor the following parameters in surface water, temperature, pH, electrical conductivity, dissolved oxygen, oxidation-reduction potential, and chloride content. To analyze these parameters in detail, and particularly to interrelate them, would be a difficult task liable to human error. A computer system could be developed that would perform all of these opera-

ions easily, and at the same time, present a total picture. The minicomputer is a key to such a system because it is small, inexpensive, and tolerant of a wide variety of environmental conditions. As an example, the PDP-8/F minicomputer is used as the central element of the system. Each instrument used in the system, such as a pH meter or a conductivity meter, produces an electrical signal that is proportional to the parameter being measured. For the computer to use these signals, two things are necessary: First, the hardware must convert the signals into a form that the computer can use, and second, correct programming must be used. To convert alalog signals into digital form, a converter (ADC) is used, aided by instrumentation-grade analog amplifiers, if necessary. Such a system in a laboratory lends itself to other types of instrumentation, such as gas chromatography, spectrophotmetry, and infrared and ultraviolet spectrometry. (Mortland-Battelle)
W74-05297

THE ULTRASTRUCTURE OF AN ALLOPARASITIC RED ALGA CHOREOCOLAX POLYSIPHONIAE,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5C.
W74-05299

POLYCHLORINATED BIPHENYLS IN THE SEASTAR ACANTHASTER PLANCI,
Walla Walla Coll., College Place, Wash. Dept. of Biology.
L. R. McCloskey, and K. H. Deubert.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 5, p 261-264, November 1973. 2 fig, 4 ref.

Descriptors: *Polychlorinated biphenyls, *Pesticide residues, *Gas chromatography, Separation techniques.
Identifiers: *Starfish, Cleanup, Tissue, Echinoderms, Gas liquid chromatography, Thin layer chromatography, Electron capture gas chromatography, Nitration, Biological samples.

Procedures for separating PCB in small amounts of gonad tissue specimens from the starfish Acanthaster planci are described. Cleanup was done using disposable Pasteur pipettes. The columns were filled with Florisil activated for 24 hours at 130 C. Columns were packed in petroleum ether (30-60 C) and washed with 20 ml of petroleum ether prior to use. Extracts equivalent to one to two grams of fixed tissue were used for cleanup and PCBs were eluted with a volume (5-7 ml) of petroleum ether (30-60 C) that eluted 1 microgram of Aroclor 1254 to approximately 96 percent. A solvent blank was run with each extraction. Eluates were concentrated to 0.5 ml, and 1- to 5-microliter aliquots were analyzed by GLC-EC. TLC analysis was also carried out. Nitration of cleaned-up residues did not change the basic peak pattern, except to add new peaks. All tissue extracts produced peaks with the following retention times relative to p,p'-DDE: 0.45, 0.79, 1.0, 1.09, 1.35, 1.70, 2.14, 2.61, and 3.19. These peaks were also obtained with Aroclor 1254, and they did not disappear after nitration. TLC analysis of the extracts produced spots with R sub f values 0.72, 0.80, and 0.92, whereas Aroclor 1254 produced two overlapping spots. Approximate R sub f values were 0.7 and 0.8. The accuracy of the quantitation cannot be determined because of the differences between the peak patterns produced by Aroclor 1254 and the extracts. However, quantities estimated in this study seem to be in agreement with data obtained in similar studies on marine organisms. (Mortland-Battelle)
W74-05301

FIELD IONIZATION MASS SPECTROMETRY: A NEW TOOL FOR THE ANALYTICAL CHEMIST,
Stanford Research Inst., Menlo Park. Calif.
M. Anbar, and W. H. Aberth.
Analytical Chemistry, Vol 46, No 1, p 59-64, January 1974. 9 fig, 11 ref.

Descriptors: *Mass spectrometry, *Spectrophtometry, Ionization, Tracers, Isotope studies, Oil, Chemical analysis.
Identifiers: Field ionization, *Molecular tracers, Isotope dilution, No. 6 fuel oil, Oil characterization, Methaqualone, Phenobarbital, Norchlorpromazine.

Multipoint field ionization sources developed in recent years are discussed in detail and some new applications of mass spectrometry made possible by field ionization are reviewed. This technique provides nonfragmented and isotopically nonscrambled mass spectra which will open up at least two important areas of application: (1) analysis of complex multicomponent mixtures without preparation and (2) isotope dilution analysis by use of multilabeled molecular tracers. Field ionization spectra are shown for methaqualone, phenobarbital, norchlorpromazine, and No. 6 fuel oil. Field ionization mass spectrometry promises to provide a powerful tool in a diversity of fields including environmental research. (Mortland-Battelle)
W74-05302

GRADIENT TITRATION-A NOVEL APPROACH TO CONTINUOUS MONITORING USING ION-SELECTIVE ELECTRODES,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-05303

INVESTIGATION OF THE FACTORS AFFECTING THE RESPONSE TIME OF A CALCIUM SELECTIVE LIQUID MEMBRANE ELECTRODE,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-05304

ANODIC STRIPPING VOLTAMMETRY OF ZINC IN SEAWATER WITH A TUBULAR MERCURY-GRAPHITE ELECTRODE,
Naval Undersea Center, San Diego, Calif. Chemical Oceanography Branch.
S. H. Lieberman, and A. Zirino.
Analytical Chemistry, Vol 46, No 1, p 20-23, January 1974. 5 fig, 2 tab, 14 ref.

Descriptors: *Zinc, *Sea water, *Pollutant identification, Water analysis, Trace elements, Heavy metals, Chemical analysis, Measurement, Flow rates, Cadmium, Lead, Copper, Instrumentation.
Identifiers: *Anodic stripping voltammetry, *Tubular mercury-graphite electrodes, Detection limits, Precision, Accuracy, Mercury graphite electrodes, Reproducibility.

A tubular mercury-graphite electrode (TMGE) has been used to measure zinc in flowing solutions by anodic stripping voltammetry. Fabrication of the electrode and a new method of applying and maintaining a consistently active mercury thin film on a graphite electrode are described. Application of the TMGE to anodic stripping voltammetry of Zn in seawater yields peak currents that are linear with concentration. Measurements are reproducible with a relative standard deviation of plus over minus 9.5 percent at the 0.3 nM level. The system is more sensitive than a comparable static system. Five-minute analysis times permit detection of zinc in sea water at concentrations of 1 nM. The Zn peak current and trace metal peak potentials are described as a function of plating time, rate of solution flow, and other variables. (Holoman-Battelle)
W74-05305

CHARACTERIZATION OF WOOD-PRESERVING COAL-TAR CREOSOTE BY GAS-LIQUID CHROMATOGRAPHY,
Forest Service (USDA), Madison, Wis. Forest Products Lab.
F. H. M. Nestler.
Analytical Chemistry, Vol 46, No 1, p 46-53, January 1974. 3 fig, 6 tab, 12 ref.

Descriptors: *Creosote, *Wood preservatives(Pesticides), *Coal tar coating, Physical properties, Gas chromatography, Aromatic compounds, Organic compounds, Methodology, Distillation, *Chromatography.
Identifiers: Characterization, *Gas liquid chromatography, Retention time, Aromatic hydrocarbons, Precision, Boiling point, Naphthalene, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyls, 2 6-Dimethylnaphthalene, 2 3-Dimethylnaphthalene, Carbazole, Acridine, Acenaphthene, Dibenzofurans, Fluorene, Phenanthrene, Anthracene, 2-Methylanthracene, 9-Methylanthracene, 2-Phenylnaphthalene, Fluoranthene, Pyrene, 2 3-Benzofluorene, Chrysene, n-Eicosane.

Six whole coal-tar creosotes, two of which represent contemporary commercial production, were analyzed by GLC on an SE-30 packing. Retention data for 14 standard compounds were determined for the four liquid phases: SE-30, ApL, OV-17, DEGS. The linear relationship observed between log relative retention in SE-30 and atmospheric boiling point permitted the quantitative interpretation of isothermal chromatograms in terms of a simulated distillation analysis. The latter results agreed very well with precision fractional distillation data, but much less so with the American Wood-Preservers' Association Standard Method. The boiling ranges selected for comparison of the three sets of data were those established for the AWPA Standard Method. (Holoman-Battelle)
W74-05306

USE OF MULTIPLE R SUB F VALUES FOR IDENTIFICATION BY PAPER AND THIN-LAYER CHROMATOGRAPHY,
Wisconsin Univ. Madison. School of Pharmacy.
K. A. Connors.
Analytical Chemistry, Vol 46, No 1, p 53-58, January 1974. 7 fig, 2 tab, 37 ref.

Descriptors: *Chromatography, *Solvents, Statistical methods, Pollutant identification.
Identifiers: R sub f values, Paper chromatography, Thin layer chromatography.

This paper attempts to define how many chromatographic solvent systems should be used in identifying unknowns and how these systems should be selected. Maximum information from chromatography for qualitative analysis is obtained when the R sub fx value for a compound in system X is independent of its value R sub fy in another system Y. It is found, for such systems, that the distribution of points in the R sub fx, R sub fy plane is closed to a Poisson distribution. The number of independent R sub f values required to identify a compound at a specified level of uncertainty can be calculated. Independence of R sub f values is enhanced by using chromatographic systems that are qualitatively different from each other. In many analytical situations, the analyst might make planned use of the considerations presented in this paper. A rough estimate of the size of the population can usually be made. The nature of the distribution of points in the R sub fx, R sub fy plane can be established experimentally, and application of the above guideline experimentally, and application of the above guideline may lead to efficient selection of uncorrelated systems. (Mortland-Battelle)
W74-05307

INDUCTIVELY COUPLED PLASMA-OPTICAL EMISSION ANALYTICAL SPECTROMETRY. A COMPACT FACILITY FOR TRACE ANALYSIS OF SOLUTIONS,
Ames Lab., Iowa.
R. H. Scott, V. A. Fassel, R. N. Kniseley, and D. E. Nixon.
Analytical Chemistry, Vol 46, No 1, p 75-80, January 1974. 8 fig, 3 tab, 35 ref.

Descriptors: *Heavy metals, *Aqueous solutions, *Laboratory equipment, *Trace elements, *Spectroscopy, Water analysis, Aluminum, Calcium, Cobalt, Chromium, Nickel, Lead, Titanium, Zinc.
Identifiers: Plasma-optical emission spectroscopy, Detection limits, Barium, Selenium, Vanadium, Yttrium, Trace levels.

This paper describes a compact inductively coupled plasma-optical emission system for the trace determination of metallic elements in solution. Theoretical considerations are presented to determine operating parameters which agree well with the empirically determined values. The aerosol desolvation system commonly used with this type of source has been eliminated, and pneumatic nebulization is employed in place of the more elaborate ultrasonic method. Some characteristics of the plasma are reported. Detection limits are in the range of 0.1-10 mg/ml for Al, Ba, Ca, Co, Cr, Ni, Pb, Se, Ti, V, Y, and Zn. The facility is readily adaptable to simultaneous multielement trace analysis. (Little-Battelle)
W74-05309

PRESERVATION OF DILUTE MERCURY SOLUTIONS,
Oak Ridge National Lab., Tenn.
C. Feldman.
Analytical Chemistry, Vol 46, No 1, p 99-102, January 1974. 9 fig, 1 tab, 9 ref.

Descriptors: Water storage, *Mercury, *Stability, Water analysis, Aqueous solutions, *Pollutant identification.
Identifiers: *Sample preservation, *Chemical loss, Reference samples, Losses.

Distilled water solutions containing 0.1-10.0 ng Hg/ml were stored for 10 days in glass and polyethylene containers. Those which were untreated, or treated with nitric acid, sulfuric acid plus potassium permanganate, or potassium chromate, lost substantial fractions of their mercury in this period. Solutions stored in polyethylene and treated with 5 percent (v/v) nitric acid plus 0.05 percent chromate ion stayed at full strength for at least ten days. Solutions stored in glass and treated with 5 percent (v/v) nitric acid plus 0.01 percent chromate ion stayed at full strength for as long as five months. The causes of losses in distilled and natural water samples are discussed. (Little-Battelle)
W74-05310

SOLVENT EXTRACTION OF METAL CHELATES INTO WATER-IMMISCIBLE ACETONE,
Kentucky Univ., Lexington. Dept. of Chemistry.
C. E. Matkovich, and G. D. Christian.
Analytical Chemistry, Vol 46, No 1, p 102-106, January 1974. 5 fig, 4 tab, 15 ref.

Descriptors: *Separation techniques, *Solvent extractions, *Aqueous solutions, *Heavy metals, Solvents, Water analysis, Chromium, Manganese, Iron, Cobalt, Nickel, Copper, Zinc, Titanium, Chelation.
Identifiers: Scandium, *Metal, Chelates.

Acetone is separated from aqueous solutions via salting-out with either saturated calcium chloride or 65 wt percent sucrose. Several metal ammonium l-pyrrolidinecarbodithioate and dithizone chelates were successfully extracted from calcium chloride solutions into the acetone phase while metal oxine chelates were extracted from sucrose solutions. Solvent extraction curves are reported. The metals considered include Sc, Cr, Mn, Fe, Co, Ni, Cu, Ti, and Zn. (Little-Battelle)
W74-05311

ESTERIFICATION OF (2,4-DICHLOROPHENOXY)ACETIC ACID - A QUANTITATIVE COMPARISON OF ESTERIFICATION TECHNIQUES,
Saskatchewan Univ., Saskatoon. Dept. of Chemistry and Chemical Engineering.
J. Horner, S. S. Que Hee, and R. G. Sutherland.
Analytical Chemistry, Vol 46, No 1, p 110-112, January 1974. 2 tab, 11 ref.

Descriptors: *2 4-D, Gas chromatography, Nuclear magnetic resonance, Chemical analysis, *Chlorinated hydrocarbon pesticides, Herbicides, Methodology.
Identifiers: *Sample preparation, *Esterification, Purity, *Gas liquid chromatography, Mass spectra, Infrared spectra, NMR spectra.

Esterification of 2,4-D with BF3/alcohol mixtures for gas chromatography produces esters in greater than 90 percent yield in 20 minutes with few byproducts. Diazoalkylation is also efficient but produces many impurities. In addition, the reagent is more difficult to make and is more labile than the BF3/alcohol mixtures. Mineral acid catalysis of 2,4-D/alcohol mixtures is time consuming and inefficient. The esters produced by silylation are unstable. The purity of the ester was determined by GLC analysis with thermal conductivity, flame ionization, and electron capture detectors. Mass, infrared, and NMR spectra of the pure compounds were used to confirm the presence of the prepared esters, and the identity of collected compounds separated by thermal conductivity GLC. Retention times of the prepared esters were compared with those of authentic esters. (Little-Battelle)
W74-05312

EFFECTS OF SURFACTANTS ON ATOMIC ABSORPTION ANALYSIS OF DILUTE AQUEOUS COPPER AND NICKEL SOLUTIONS,
Missouri Univ., Rolla. Dept. of Chemistry.
R. L. Venable, and R. V. Ballad.
Analytical Chemistry, Vol 46, No 1, p 131-133, January 1974. 4 fig, 7 ref.

Descriptors: *Aqueous solutions, *Copper, *Nickel, Stabilization, Surfactants, Chemical analysis, Heavy metals, *Spectrophotometry.
Identifiers: *Anionic surfactants, Atomic absorption spectrophotometry, Absorbance, Sodium dodecyl sulfate, Sodium lauryl sulfate, Tetradecylpyridinium bromide, Critical micelle concentration.

Dilute (approximately 3 micrograms/ml) Cu and Ni solutions were analyzed by atomic absorption spectrophotometry upon the addition of the anionic surfactant, sodium dodecyl sulfate (SDS). One effect was the enhancement of absorption in acidic copper and nickel solutions containing SDS above the critical micelle concentration (CMC) over the same acidic copper and nickel concentrations without surfactant present. The second effect seemed to be either prevention of precipitate formation or stabilization of a colloidal dispersion in basic solutions at surfactant concentrations approaching and above the CMC. It was concluded that certain anionic surfactants can cause erroneus results in the AAS analysis of dilute aqueous metal ion solution. However, SDS and maybe other such surfactants can potentially be used to keep metals in solution where acidic pH values are not tolerable. (Holoman-Battelle)
W74-05313

DETERMINATION OF TRACE AMOUNTS OF C2-C5 ACIDS IN AQUEOUS SOLUTIONS BY GAS CHROMATOGRAPHY,
Rome Univ. (Italy). Istituto di Chimica Analitica.
A. Di Corcia, and R. Samperi.
Analytical Chemistry, Vol 46, No 1, p 140-143, January 1974. 4 fig, 1 tab, 14 ref.

Descriptors: *Aqueous solutions, *Gas chromatography, Separation techniques, Organic, Acids, Water analysis, Distillation, *Pollutant identification.
Identifiers: *Fatty acids, Acetic acid, Propionic acid, Isobutyric acid, Butyric acid, 2-Methylbutyric acid, 3-Methylbutyric acid, Valeric acid, Flame ionization detector, Graphitized carbon black, Polyethylene glycol, Phosphoric acid.

An improved chromatographic method is reported for the rapid determination of aqueous solutions of the seven acids at concentrations down to 0.3 ppm, using Graphitized Carbon Black (GCB) modified with appropriate amounts of H3PO4 and polyethylene glycol 20 M. Column packings were prepared by dissolving appropriate amounts of the two phases, H3PO4 and polyethylene glycol (PEG) 20 M (Carlo Erba), in methanol and coating on the GCB by a slurry technique. Methanol was removed with use of a heat lamp. While drying, stirring of these materials must be avoided, as it may cause in some measure crushing of the graphitized carbon particles. Dried materials were revieved to maintain the proper mesh range. Columns made from glass tubings whose dimensions are specified in the captions of the figures were packed by moderately vibrating with the aid of a vibrator. The first four centimeters of the inlet side of each column were left empty to use them as an expansion chamber for injected liquid samples. Columns were then conditioned for 24 hours at 240C. Using a suitably modified GCB surface allows quantitative determinations of C2-C5 acids to be made quite easily even at sub-ppm concentrations. The effect of adding PEG-20 M is twofold: first, it neutralizes residual 'hot sites' and, second, it reduces the surface area available for adsorption of eluate molecules, thus decreasing retention times. (Mortland-Battelle)
W74-05314

ANALYSIS OF PRIMARY AROMATIC AMINES AND NITRITE BY DIAZOTIZATION AND PYROLYSIS GAS CHROMATOGRAPHY,
Massachusetts Univ., Amherst. Dept. of Chemistry.
A. Savitsky, and S. Siggia.
Analytical Chemistry, Vol 46, No 1, p 153-155, January 1974. 3 tab, 13 ref.

Descriptors: *Gas chromatography, *Nitrites, *Aromatic compounds, Water analysis, Aqueous solutions, Pollutant identification.
Identifiers: *Aromatic Amines, *Diazotization, *Pyrolysis gas chromatography, Diazonium salts, Anisidine, Sodium sulfanilate, Metanilic acid, Anthranilic acid, Aminobenzoic acid, Benzidine, Diphenyl amine sulfonic acid, Methyl amine, Phenyl anthranilic acid, Triphenyl amine, Diethyl amine, Accuracy, Precision, Chemical interference.

A pyrolysis gas chromatographic method for analysis of diazonium salts has recently been developed. Since only primary aromatic amines produce stable diazonium salts upon diazotization and only diazonium salts should liberate nitrogen upon mild pyrolysis, adaptation of the pyrolysis gas chromatographic method has been investigated as a specific method for measuring primary aromatic amine content of mixtures. The feasibility of the pyrolysis gas chromatographic technique was demonstrated by analysis of primary aromatic amines of known purity. The percent recoveries by pyrolysis indicate that diazotization proceeds quantitatively and that the manipulation of the diazonium salts preserves them for analysis. Low, though reproducible, results were obtained

for benzidine. Generally the precision and accuracy of the analysis was on the order of 1-2 percent. The analysis of mixtures for primary aromatic amine content was carried out by diazotizing in platinum boats. This was necessary because of insolubility of the products of some secondary and tertiary aromatic amines. The ability of pyrolysis gas chromatography to selectively determine the diazonium salts produced upon reaction with nitrous acid was demonstrated. Analysis of nitrite in nitrate required special modification of the diazotization conditions. Anthranilic acid was chosen for diazotization because its diazonium salt has good water solubility. (Mortland-Battelle)
W74-05315

SPATIAL VARIABILITY OF THE PRODUCTIVITY: BIOMASS RATIO FOR PHYTOPLANKTON IN A SMALL MARINE BASIN,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 5C.
W74-05316

BREEDING AND GROWTH OF THE CHAETOGNATH SAGITTA ELEGANS IN BEDFORD BASIN,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W74-05317

DAPHNIA DISTRIBUTION WITHIN LANGMUIR CIRCULATIONS,
Freshwater Biological Association, Windermere (England).
For primary bibliographic entry see Field 5C.
W74-05318

SETTLING PLATES OF COLD-CURE ACRYLIC PLASTIC REPLICATED FROM NATURAL SURFACES,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
M. J. Risk.
Limnology and Oceanography, Vol 18, No 5, p 801-802, September 1973. 10 ref.

Descriptors: *Plastics, *Sampling, *Artificial substrates, Algae, Invertebrates, Biological communities.
Identifiers: *Settling plates, Formatray, Acrylics, Colonizing.

Many different substances have been used in the field and in the laboratory as substrates for colonizing communities of plants and animals. 'Formatray', a strong inert, cold-cure dental acrylic, seems to satisfy most of the requirements of an ideal settling plate material. Settling plates were made by pouring mixed Formatray into latex rubber impressions of various surfaces. Latex impressions can successfully be made of almost any natural surface. Formatray has about 40 percent calcium carbonate filler material and chemically approximates a calcareous sandstone or siltstone. A virtually unlimited number of plates can be poured up from one latex impression, thus allowing the operator to place identical plates in different locations or a series of plates, chemically identical and texturally different, in one location. In the field, plates are colonized rapidly and support heavy growths of algae and invertebrates. In a preliminary study in Big Fisherman's Cove, Santa Catalina Island, California, plates set out in shallow water picked up the most common algae settling on rocks in the area. So far, 41 species of algae and at least 11 species of invertebrates have been identified growing on these plates; there seems to be no selective exclusion of groups. (Mortland-Battelle)
W74-05319

PREPARATION OF FILTERED PLANKTON AND DETRITUS FOR STUDY WITH SCANNING ELECTRON MICROSCOPY,
California Univ., Davis. Inst. of Ecology.
H. W. Paerl, and S. L. Shimp.
Limnology and Oceanography, Vol 18, No 5, p 802-805, September 1973. 3 fig, 1 tab, 8 ref.

Descriptors: *Detritus, *Diatoms, *Electron microscopy, Dehydration, Filters, Lakes, Sea water, Sediments, Periphyton, Bacteria, Storage.
Identifiers: *Sample preparation, *Scanning electron microscopy, Sample preservation, Nuclepore filters, Lake Tahoe, Fixation.

A simple, rapid method of fixing plankton and detritus for the scanning electron microscope is described, which can be used in the laboratory or in the field. The sample is fixed with 2 percent glutaraldehyde followed by stepwise dehydration in increasing concentrations of ethyl alcohol. Fixed samples can be stored for up to 2 weeks. Critical point drying of the fixed samples is done in the laboratory. Nuclepore filters proved superior to other filters for most sample preparations. (Mortland-Battelle)
W74-05320

A SAMPLER FOR THE CHEMICAL ANALYSIS OF FRESHWATERS USING EVACUATED TUBES,
Trent Univ., Peterborough (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 7B.
W74-05321

FISH VIRUSES: ISOLATION AND IDENTIFICATION OF INFECTIOUS HEMATOPOIETIC NECROSIS IN EASTERN NORTH AMERICA,
Bureau of Sport Fisheries and Wildlife, Kearneysville, W. Va. Eastern Fish Disease Lab.
K. Wolf, M. C. Quimby, L. L. Pettijohn, and M. L. Landolt.
Journal of the Fisheries Research Board of Canada, Vol 30, No 11, p 1625-1627, November 1973. 1 fig, 1 tab, 11 ref.

Descriptors: *Isolation, *Pollutant identification, *Fish diseases, Methodology, Testing procedures, *Rainbow trout, Viruses, Electron microscopy, Fish eggs, Fry.
Identifiers: *IHN virus, *Infectious hematopoietic necrosis, Histopathology, Salmo gairdneri, Plaque counts, Rhabdoviruses, Sample preparation.

Infectious hematopoietic necrosis virus (IHNV) was isolated from diseased fingerling rainbow trout (Salmo gairdneri) from a hatchery in West Virginia. Clinical signs, histopathologic findings, and origin of eggs provided a basis for diagnosis, and virus was isolated and presumptively identified by plaque characteristics. Serum neutralization tests provided positive identification of the agent as IHNV, and electron microscopy showed its rhabdovirus morphology. Experimental infections resulted in signs of IHNV and death; test fish had characteristic histopathologic alterations and appropriate virus titers. This is the first completely documented occurrence of IHNV beyond the Pacific Northwest. (Holoman-Battelle)
W74-05322

MICROCULTURES OF BROWN BULLHEAD (ICTALURUS NEBULOSUS) CELLS: THEIR USE IN QUANTITATION OF CHANNEL CATFISH (ICTALURUS PUNCTATUS) VIRUS AND ANTIBODY,
Georgia Univ., Athens. Coll. of Veterinary Medicine.
J. B. Gratzek, M. H. McGlamery, D. L. Dawe, and T. Scott.
Journal of the Fisheries Research Board of Canada, Vol 30, No 11, p 1641-1645, November 1973. 2 fig, 3 tab, 9 ref.

Descriptors: *Cytological studies, *Assay, *Pollutant identification, Viruses, Channel catfish, Biochemistry, Fish diseases, Pollutants.
Identifiers: *Microculture methods, *Channel catfish virus, *Quantitative analysis, Brown bullhead, Cell cultures, Ictalurus nebulosus, Ictalurus punctatus, Antibodies, Plaque titration, Herpesviruses.

A microculture system was applied to the culture of brown bullhead (Ictalurus nebulosus) cells and used for the titration of channel catfish (Ictalurus punctatus) virus and corresponding antibody. As few as 17,000 cells/well could be used for routine titrations. Simultaneous inoculation of virus with cells at the time of planting resulted in clearer endpoints as opposed to inoculation of performed monolayers. When channel catfish virus antibodies were measured using plaque reduction and microculture titration assays as indicator systems, no significant differences in antibody titers were noted. (Holoman-Battelle)
W74-05323

PARAFFIN HYDROCARBON PATTERNS IN PETROLEUM-POLLUTED MUSSELS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
R. C. Clark, Jr., and J. S. Finley.
Marine Pollution Bulletin, Vol 4, No 11, p 172-176, November 1973. 4 fig, 1 tab, 9 ref.

Descriptors: *Marine animals, *Pollutant identification, *Oil pollution, Chemical analysis, Mussels, Organic compounds, Mollusks, Invertebrates, Bottom sampling, Gas chromatography, Separation techniques, Methodology, Baseline studies, Water quality.
Identifiers: *Trace levels, *Paraffins, *Petroleum hydrocarbons, Sample preparation, Data interpretation, Background levels, Hydrocarbons, Aliphatic hydrocarbons, Macroinvertebrates, Mytilus edulis, Mytilus californianus, Crude oil, Lubricating oil, No. 2 fuel oil, Fuel oil.

This paper describes how an analysis of the n-paraffin content and pattern can be used to delineate the accumulation of petroleum hydrocarbons in nature below levels of detectable odour or taste. It is possible to detect very low levels (less than 5 ppb individual n-paraffins n-14C3OH to n-37C76H) of paraffin hydrocarbons in intertidal marine organisms and to use these compounds with suitable baseline information for estimating the quantity of petroleum pollution uptake in the organisms. Under conditions of moderate to major oil pollution, this technique provides a calculation of residual paraffin hydrocarbon pattern in exposed organisms which can be compared to the pollutant hydrocarbon pattern. For low-level persistent pollution, the use of paraffin hydrocarbon patterns and content can often provide an indication of petroleum uptake but, in cases where the pollutant is low in paraffin hydrocarbons (lubricating oils, some crude oils, etc.) or where the rate of bacterial degradation is equivalent to the pollutant input different techniques of analysis are required. Exposed mussels (Mytilus spp.) collected under three differing degrees of suspected petroleum pollution are compared with unexposed control mussels: (1) 'high-level' pollution where a known pollutant was released in a single large discharge; (2) 'moderate-level' pollution where observable quantities of a known pollutant leaked over a long period; and (3) 'low-level persistent' pollution having multiple sources but no continuously visible oil slick on the water surface. (Holoman-Battelle)
W74-05326

MODEL FOR COLIFORM BACTERIA IN GRAND TRAVERSE BAY,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-05328

DIRECT COUNTS AND PLATE COUNTS OF BACTERIA IN THE DANUBE BETWEEN BERG SPRING AND ULM (IN GERMAN),
Staatl Institut fuer Seenforschung und Seenbewirtschaftung, Langenargen (West Germany).
J. Deufel.
Arch Hydrobiol Supple, Vol 44, No 1, p 1-9, 1972, English summary.
Identifiers: *Bacteria, *Germany(Danube River), *Sewage, Plate counts, Direct counts, Pollutant identification.

In the Berg Spring, and at 7 other stations of the Danube above Ulm, the number of bacteria counted by the direct method, and the number of heterotrophic, saprophytic bacteria were determined. Highest numbers could always be found during low water level below the outfalls of sewers. With the microscopic method numbers ranged from 1900/ml at Berg Spring to 36,000,000/ml at Tuttlingen, and with the plate count method from 49/ml to 640,000/ml at the same stations. The ratio direct count to plate count can be employed only with reservation to indicate the water quality. In spite of a high concentration of bacteria, the bacterial load is smallest at low water-level and highest during floods. Along the section of river investigated the bacterial load increases parallel to the rising flow.--Copyright 1973, Biological Abstracts, Inc.
W74-05362

THE DETERMINATION OF COBALT IN FISH TISSUE BY ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Government Vitamin Lab., Bergen (Norway).
K. Julshamn, and O. R. Braekkan.
Atomic Absorption Newsletter, Vol 12, No 6, p 139-141, November-December 1973. 2 fig, 2 tab, 34 ref.

Descriptors: *Cobalt, *Chemical analysis, *Fish, Trace elements, Heavy metals, Freeze drying, Hydrogen ion concentration, *Spectrophotometry.
Identifiers: Animal tissues, *Atomic absorption spectrophotometry, Sample preparation, Chemical recovery, Detection limits, Precision, Ballan wrasse, Saithe, Sand eels.

A method is described for the determination of cobalt in fish. The samples were prepared for analysis by freeze-drying and homogenization. A portion of 10 g was pre-ashed with infrared heat and then ashed in a muffle furnace at 480C. The residue was dissolved in 0.1 N hydrochloric acid, chelated with ammonium pyrrolidine dithiocarbamate, extracted with methyl isobutyl ketone, and analyzed by atomic absorption spectroscopy. Levels down to 0.01 microgram cobalt per g of fish tissue may be estimated with an average recovery of 96 percent and a coefficient of variation of 5.7-14.2 percent. (Holoman-Battelle)
W74-05399

ACETYLENE-REDUCTION ASSAY OF ANAEROBIC NITROGEN FIXATION BY SEDIMENTS OF SELECTED WISCONSIN LAKES,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-05400

5B. Sources Of Pollution

TRACE SOLUABLE ORGANIC COMPOUNDS IN POTABLE WATER SUPPLIES,
Iowa State Univ., Ames. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-04855

AN ANALYSIS OF MERCURIALS IN THE ELEPHANT BUTTE ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
D. E. Kidd, G. V. Johnson, and J. D. Garcia.
Available from National Technical Information Service as PB-228 587 $9.50 in paper copy, $1.45 in microfiche. New Mexico Water Resources Research Institute Report 035, University of New Mexico, Albuquerque, 1974, 125 p, 26 tab, 3 fig, 84 ref. OWRR A-040-NMEX(2).

Descriptors: *New Mexico, *Ecosystems, *Trophic levels, *Mercury, *Fish, Aquatic animals, Food chains, Fish diets, Zooplankton, Turtles, Crayfish, Freshwater fish, Bass, Channel catfish, Laketrout, Carp, Suckers, Walleye, Perches, Mussels, Organic matter, Spectrophotometry.
Identifiers: *Mercurials, *Elephant Butte Reservoir(N. Mex.), Bioamplification, Freshwater mussels, Nonvascular plants, Organic debris.

Samples from Elephant Butte Lake collections were analyzed for mercury by a flameless atomic absorption procedure. Analyses revealed mean ppb mercury concentrations of 0.027 in water, 57 in bottom sediments, 109 in phytoplankton, 277 in attached algae and bryophytes, 95 in plant debris, 69 in zooplankton, 90 in crayfish muscle, 26 in visceral mass of mussels, 97 in muscle of non-predaceous fish, 125 in muscle of small predaceous fish, 253 in muscle of large predaceous fish, and 266 in muscle of two turtle species. Tissue grouped by relative levels for the sixteen fish species show consistently lower levels in bone, skin, gills, and eyes; intermediate levels in stomach, intestine, heart, and brain; and higher levels in spleen, muscle, kidney, and liver. General bioamplification at higher trophic levels appears to be diet related, but the relationship does not hold for lower trophic levels. Mercury levels in water indicate a decreasing gradient from inlet to dam, while sediments display an increasing gradient from inlet to dam. An attempt is made to account for concentrations in some higher trophic level species. Evidence suggests that mercury levels are related to seasonal conditions. A bioamplification scheme and concentration factors are presented which describe the status of mercury concentrations in existing trophic levels. The potential hazards of Elephant Butte fish to human health are discussed. (Hain-New Mexico)
W74-04859

COMPUTER SIMULATION OF THE HYDROLOGIC AND SALINITY FLOW SYSTEMS WITHIN THE BEAR RIVER BASIN,
Utah Center for Water Resources Research, Logan.
R. W. Hill, E. K. Israelsen, and J. P. Riley.
Available from National Technical Information Service as PB-228 650 $4.75 in paper copy, $1.45 in microfiche. Report PRWG104-1, Utah Water Research Laboratory, College of Engineering, Utah State University, Logan, November 1973. 122 p, 18 fig, 3 tab, 54 ref, 6 append. OWRR B-065-Utah(1). 14-31-0001-3658.

Descriptors: *Simulation analysis, Management, *Salinity, *Forecasting, *Hydrologic systems, *Model studies, *Dissolved solids, Discharge(Water), Hydrology, Pollutants, Surface-groundwater relationships, *Utah, Water pollution, Surface waters, Water sampling, Data processing.
Identifiers: Dissolved solids models, Bear River basin(Utah).

Modeling concepts of the hydrologic system are based upon the development of basic relationships describing the hydrologic processes which are linked together by the continuity-of-mass principle. The salinity flow system is then linked to the hydrologic system based on the assumption that the various hydrologic processes change the chemical concentration in the system by storing, concentrating, diluting, and/or picking up additional salts. These processes are identified specifically for irrigated soils and for small storage reservoirs. The amount of storage dilution, concentration or additional pickup is specified during verification of the model. The system response is then used to predict future responses resulting from additional water resource uses. In this study the model was synthesized on the hybrid computer and applied to the Cache Valley subbasin of the Bear River basin. The ability of the model to predict increased salt concentrations is demonstrated. A method for estimating and filling data gaps is also briefly discussed.
W74-04860

CONFIRMATION OF HEXACHLOROBENZENE BY CHEMICAL REACTION,
Institut National de la Recherche Agronomique, Versailles (France).
For primary bibliographic entry see Field 5A.
W74-04871

RESPIRATION OF A SUBLITTORAL COMMUNITY,
Woods Hole Oceanographic Institution, Mass.
K. L. Smith, Jr.
Ecology, Vol 54, No 5, p 1065-1075, Late Summer 1973. 4 fig, 3 tab, 39 ref.

Descriptors: *Respiration, Biological communities, *Littoral, *Marine animals, Marine bacteria, *Seasonal, Biomass, Benthic fauna, Sediments, Crustaceans, Mollusks, Dominant organisms, Annelids, Oxidation, Bottom sampling, Marine plants, Water temperature, Salinity, Dissolved oxygen, Carbon, Soil temperature, Aquatic soils, Invertebrates, Animal metabolism, Clams, Cores, Chemical reactions, *Georgia.
Identifiers: Sublittoral, *Oxygen consumption, Species diversity, *Sapelo Island(Geo), Species abundance, Nemerteans, Coelenterates, Sipunculids, Echinoderms, Hemichordates, Pogonophorans, Species density, Meiofauna, Species diversity index, Shannon-Weiner diversity index, Sample preparation, Correlation coefficients, Polychaetes, Anthozoans, Notomastus, Glycera dibranchiata, Nephthys picta, Mellita quinquiesperforata, Haliactus, Decapods.

Respiration of a sublittoral community was examined off Sapelo Island, Georgia, from July, 1969 through July, 1970. Total community respiration ranged from 53.7 ml 02/sq m/hr in January to 92.7 ml 02/sq m/hr in July. A positive correlation was found between community respiration and water temperature. Annual community respiration was estimated to be 676.6 liters 02/sq m/yr. The macrofauna consisted of 103 species representing ten phyla. Species abundance ranged from 744 individuals/sq m in July to 14,213 individuals/sq m in March. Biomass (ash free dry wt) increased from 7.3 g/sq m in October to 20.2 g/sq m in March. Macrofaunal respiration comprised from 5 to 26 percent of community respiration. Bacteria were the major functional component of the community accounting for 30 percent to 60 percent of the total respiration. Meiofaunal-microfaunal-microfloral respiration contributed from 25 percent to 58 percent of total community respiration. Sediment chemical oxidation was responsible for 2.8 ml 02/sq m/hr in January to 8.5 ml 02/sq m/hr in July of the total oxygen uptake. (Holoman-Battelle)
W74-04874

ULTRASTRUCTURE OF THE GREEN ALGA DICHOTOMOSIPHON TUBEROSUS WITH SPECIAL REFERENCE TO THE OCCURRENCE OF STRIATED TUBULES IN THE CHLOROPLAST,
Illinois Univ., Urbana. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W74-04881

THE PRODUCTION OF HYDROGEN PEROXIDE BY BLUE-GREEN ALGAE: A SURVEY,
Texas Univ., Austin. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-04882

SPECIES OF OCEANIC DINOFLAGELLATES IN THE GENERA DISSODINIUM AND PYROCYSTIS: INTERCLONAL AND INTERSPECIFIC COMPARISONS OF THE COLOR AND PHOTON YIELD OF BIOLUMINESCENCE,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
E. Swift, W. H. Biggley, and H. H. Seliger.
Journal of Phycology, Vol 9, No 4, p 420-426, December 1973. 2 fig, 4 tab, 54 ref.

Descriptors: *Marine algae, *Dinoflagellates, *Bioluminescence, Protozoa, Biological properties, Color, Speciation, Phytoplankton, Cultures, Chemical analysis, Methodology, Carbon, Nitrogen, Plant growth.
Identifiers: *Clones, *Bioenergetics, Photon yield, Gonyaulax spp, Pyrocystis acuta, Pyrocystis fusiformis, Pyrocystis noctiluca, Pyrodinium bahamense, Dissodinium lunula, Luciferase.

An examination was made of the bioluminescence of 5 clones of Dissodinium, 1 clone of Pyrocystis acuta, 4 clones of Pyrocystis fusiformis, and 5 clones of Pyrocystis noctiluca. All clones produced the same color bioluminescence with an intensity peak near 474 nm. The in vivo emission spectra of these clones agreed with those previously determined for 4 other species of marine dinoflagellates. The amount of light emitted by the dinoflagellates in scotophase when mechanically stimulated to exhaustion was determined for most of the clones. The largest species, P. noctiluca and P. fusiformis, emitted 37-89 billion photons/cell and 23-62 billion photons/cell, respectively, about a thousand times as much light as Gonyaulax species. Pyrocystis acuta emitted 3-6 billion photons/cell. Three of the 5 clones of Dissodinium were bioluminescent. The range for 3 clones was 5-13 billion photons/cell. All 5 clones of Dissodinium are morphologically distinct. Both the clones of Dissodinium and Pyrocystis produced much higher numbers of photons per cell nitrogen (ca. 7-50 times) than Gonyaulax polyedra or Pyrodinium bahamense. The data suggested that enzyme turnover occurred in the reactions producing light during mechanical stimulation of Dissodinium and Pyrocystis species. (Holoman-Battelle)
W74-04883

CHLOROPHYLL, NITROGEN, AND PHOTSYNTHETIC PATTERNS DURING GROWTH AND SENESCENCE OF TWO BLUE-GREEN ALGAE,
Queen's Univ., Kingston (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-04884

DEGRADATION OF PARATHION BY BACTERIA ISOLATED FROM FLOODED SOIL,
Central Rice Research Inst., Cuttack (India). Dept. of Soil Microbiology.
R. Siddaramappa, K. P. Rajaram, and N. Sethunathan.
Applied Microbiology, Vol 26, No 6, p 846-849, December 1973. 3 tab, 13 ref.

Descriptors: *Alluvium, *Microbial degradation, *Pseudomonas, Soil bacteria, Phosphothioate pesticides, Nitrites, Isolation, Metabolism, Aerobic bacteria, Insecticides, Organophosphorus pesticides, Biodegradation, Hydrolysis, *Path of pollutants.
Identifiers: *Parathion, *Bacillus, *Fate of pollutants, Chemical recovery, p-Nitrophenol, Metabolites, Degradation products, Culture media, Flooded soil.

Bacillus sp. and Pseudomonas sp. were isolated from parathion-amended flooded alluvial soil which had demonstrated parathion-hydrolyzing ability. When Pseudomonas was incubated with 50 micrograms of parathion, 19 micrograms of p-nitrophenol was recovered within 4 h of incubation as the hydrolysis product. After 20 h parathion was completely destroyed and no p-nitrophenol could be detected. When Pseudomonas was grown in a N2-free medium with p-nitrophenol as the sole carbon source, nitrite-nitrogen was released in proportion to the amount of p-nitrophenol degraded. Bacillus sp. was incubated as above with 166 micrograms of p-nitrophenol being metabolized, releasing 43 micrograms of nitrite. The bacterium failed to metabolize intact parathion to yield either nitrite or p-nitrophenol. (Holoman-Battelle)
W74-04889

COMPOSITION AND WASTE LOAD OF UNIT EFFLUENTS FROM A COMMERCIAL LEAFY GREENS CANNING OPERATION,
Georgia Univ., Experiment. Div. of Food Science.
For primary bibliographic entry see Field 5A.
W74-04904

CHARACTERISTICS OF PHOSPHORUS DEFICIENCY IN ANABAENA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W74-04905

POPULATION CHANGES IN ENTERIC BACTERIA AND OTHER MICROORGANISMS DURING AEROBIC THERMOPHILIC WINDROW COMPOSTING,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
For primary bibliographic entry see Field 5D.
W74-04908

REPORT ON THE COMPOSITION OF OIL FROM THE REGION OF NEW HYDROCARBON UPWELLING IN THE SANTA BARBARA CHANNEL,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5A.
W74-04919

CURRENTS AROUND THE HAWAIIAN ISLANDS. A STUDY OF COASTAL CURRENTS IN RESPECT TO SEWAGE DISPOSAL,
Hawaii Inst., of Geophysics, Honolulu.
D. E. Avery, D. C. Cox, and T. Laevastu.
Report No 26, Interim Progress Report 1, January 1963. 22 p, 13 fig, 3 tab.

Descriptors: *Hawaii, *Currents(Water), Coasts, *Islands, Tides, Circulation, Reefs, Channels, Topography, *Waste disposal, *Path of pollutants, Data collections, Sewage disposal.
Identifiers: *Tidal currents, Littoral currents, Windward, Leeward.

As part of a larger study on the dispersal and transport of waste in coastal areas, this interim report deals mainly with currents. Data gathered during the summer and fall of 1962 are presented in the appendix. Subjects are: nature of tides around the Hawaiian Islands; behavior of tidal currents and their relation to tidal amplitudes; separation of coastal and offshore circulations; influence of depth of water and coastal topography on the coastal currents; currents inside reefs and in channels; surface currents on windward and leeward sides of the islands; change of currents with depth; and currents around sewer outfalls. (Sinha-OEIS)
W74-04925

A REVIEW OF ESTUARINE MODELING,
New York Univ., Bronx. Dept. of Meteorology and Oceanography.
For primary bibliographic entry see Field 2L.
W74-04929

ON THE MEASUREMENT OF TURBULENCE IN ESTUARIES,
Connecticut Univ., Groton. Marine Sciences Inst.
W. F. Bohlen.
In: IEEE Conference on Engineering in the Ocean Environment, San Diego, California, September 21-24, 1971. (IEEE Publication 71 C40-OCC) p 238-242, 1971. 18 ref.

Descriptors: *Estuaries, *Diffusion, Turbulence, *Environmental effects, Instrumentation, Models, *Path of pollutants, Tides, *Density stratification.
Identifiers: Bottom roughness.

Evaluation of the diffusion characteristics of an estuary requires an understanding of the turbulence structure and a measure of the range and variability of the eddy diffusion coefficients. Such data are of primary importance to investigators seeking to estimate possible environmental changes through predictive numerical or hydraulic models. A review is presented of the turbulence problem with particular emphasis on estuaries. Both spectral characteristics and spatial scales are considered and related to experimental procedures. Currently available instrumentation is reviewed and its performance criticized. Emphasis is placed on long-term reliability. Both Lagrangianhe summer, deposition is slight becuase of low runoff, southward littoral drift, and northwest winds. The well-mixed estuarine system also precludes the net transport of sediments into the tidal entrance and up the estuarine channel. (Sinha-OEIS)
W74-04933

SALINITY INTRUSION IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W74-04954

WATER QUALITY IN ALASKAN CAMPGROUNDS,
Alaska Univ., College. Inst. of Water Resources.
R. S. Murphy.
Available from the National Technical Information Service as PB-228 851, $9.00 in paper copy, $1.45 in microfiche. Report No. IWR-38, 1973. 108 p, 1 fig, 22 tab, 52 ref, 2 append. OWRR B-009-ALAS(1).

Descriptors: *Camping, *Recreational facilities, *Recreational wastes, *Water supply systems, Water quality, Water sources, Waste disposal, Water pollution sources, *Alaska, Potable water.
Identifiers: *Campgrounds.

An evaluation is presented of water quality in Alaskan Campgrounds using laboratory determinations and on-site evaluations. In general, ground water quality was excellent and surface water quality unacceptable for human consumption and total body contact recreation. The most pressing need was the provision of an approved drinking water supply for each campground. The environmental health aspects of campgrounds were found to be largely neglected. Many of the sewage systems are inadequate, resulting in pollution of the ground and surface water. Solid waste was stored and disposed of by unacceptable methods. Finally, many campgrounds are located in swampy areas or in areas subject to annual flooding. (Hartman-Alaska)
W74-04974

AN ANALYSIS OF THE WATER QUALITY PROBLEMS OF THE SAFFORD VALLEY, ARIZONA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
A. B. Muller, J. F. Battaile, L. A. Bond, and P. W. Lamson.
Available from the National Technical Information Service as PB-228 871, $12.50 in paper copy,

$1.45 in microfiche. Report No. 15, Natural Resource Systems Series, February 1973. 126 p, 26 fig, 17 tab, 22 map plates, 81 ref. OWRR A-999-ARIZ(3).

Descriptors: *Water quality, *Salinity, *Salt tolerance, *Saline water, Artesian aquifers, Agriculture, Groundwater recharge, Social impact, Economic impact, Hydrologic systems, Conductivity, *Arizona, Irrigation water, Crop response, Model studies, Water pollution sources.
Identifiers: *Safford Valley(Ariz).

Changes in groundwater quality averaging 0.13 millimhos electrical conductivity and 35 ppm chloride increase are documented between 1940 and 1972. The decrement in the water quality of the surficial aquifer is attributed to the interaction of four major mechanisms. Brine leakage from underlying artesian aquifers, natural recharge of the surficial aquifer by saline waters, recharge of the aquifer by concentrated agricultural waters, and lateral groundwater movement through saline lacustrine beds appear to be the major salt sources. A chemical thermodynamic computer model of recharge water quality, and the construction of iso-chemical maps from analyzed water samples show artesian aquifer leakage to be the significant contribution of salts to the system. An economic analysis of the Safford Valley, based on the modeling of a 'representative farm' analog, indicates that cotton will remain economical to produce on the basis of the projected salinity trends, for a significant time beyond the limits of prediction of the models employed. A sociologic analysis of the area, based on an extensive questionnaire survey, shows that although the local farmers are aware of the salinity problems in the area they are not greatly concerned by them. (Muller-Arizona)
W74-04976

SOME ASPECTS OF THE ROLE OF USNIC ACID IN FOREST ECOLOGY,
New Mexico Univ., Albuquerque. Dept. of Biology.
Y. C. Rogers.
Available from the National Technical Information Service as PB-228 874, $6.25 in paper copy, $1.45 in microfiche. M Sc Thesis, 1972. 59 p, 7 tab, 3 fig, 38 ref. OWRR A-039-NMEX(3).

Descriptors: *New Mexico, *Ecology, Forestry, Lichens, Bacteria, Microorganisms, Biology, Fungi.
Identifiers: *Usnea tillandsioides, *Usnic Acid, Aboreal lichen.

The objectives were to obtain a measure of the amount of Usnea that falls to the forest floor; to determine if there is any difference between usnic acid production in the summer and the fall; to determine if rainwater is an important factor in leaching usnic acid out of lichen material; and to examine the effects of usnic acid upon soil microorganisms and germinating coniferous seedlings. Usnea tillandsioides, an aboreal lichen, was observed in great numbers on spruce and fir at an elevation of 11,200 feet in the Sangre de Cristo Range, New Mexico. The amount of fallen lichen material per hectare was estimated. Extractions from lichen thallus demonstrated that the quantity of usnic acid was less in summer lichens than in fall lichens. An examination of extracted rainwater did not indicate that usnic acid was being leached from lichens by rainfall. The small amount of usnic acid present in soil and litter samples suggested that decomposition of usnic acid must be taking place. Soil fungi and bacteria cultured in a liquid medium containing usnic acid allowed measurements and extrapolation of these organisms' ability to degrade usnic acid. Coniferous seeds were also subjected to usnic acid and compared for their ability to germinate and form roots under various concentrations. Further experimentation with young trees indicated that usnic acid may be extremely damaging when applied to roots in a concentration of 0.2 mg/ml ethyl acetate. (Creel-New Mexico)
W74-04979

APPLICATION OF BOUNDARY-LAYER THEORY TO DISPERSION IN NON-STRATIFIED TWO-DIMENSIONAL ESTUARIES,
Nielsen Engineering and Research, Inc., Mountain View, Calif.
For primary bibliographic entry see Field 2L.
W74-04983

SOME CHARACTERISTICS OF FLUORIDE MIGRATION IN GROUNDWATER OF MOLDAVIA (O NEKOTORYKH OSOBENNOSTYAKH MIGRATSII FTORA V PODZEMNYKH VODAKH MOLDAVII),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2K.
W74-05016

CHARACTERISTICS OF ORGANIC-MATTER DISTRIBUTION IN CALCAREOUS SEDIMENTS OF THE CASPIAN SEA AND IN MESOZOIC CARBONATE ROCKS OF THE SOUTHEASTERN CAUCASUS (OSOBENNOSTI RASPREDELENIYA ORGANICHESKOGO VESHCHESTVA V IZVESTKOVYKH OSADKAKH KASPIYSKOGO MORYA I KARBONATNYKH PORODAKH MEZOZOYA YUGO-VOSTOCHNOGO KAVKAZA),
A. A. Ali-Zade, E. A. Daidbekova, P. A. Shoykhet, and G.-M. A. Aliyev.
Litologiya i Poleznyye Iskopayemyye, No 2, p 30-40, March-April 1973. 2 fig, 3 tab, 11 ref.

Descriptors: *Organic matter, *Organic compounds, *Sediments, *Carbonate rocks, *Mesozoic era, Recent epoch, Sedimentary basins(Geologic), Facies(Sedimentary), Oil, Petrology, Geochemistry, Water pollution sources.
Identifiers: *Caspian Sea, *USSR(Caucasus Mountains), Bitumens.

Distribution of organic matter was investigated in Recent sediments of the Caspian Sea and in Mesozoic rocks of the southeastern Caucasus. Carbonate sediments of enclosed sedimentation basins of the Caspian Sea type exhibit secondary formation of bitumens and hydrocarbons. This process involves both the shallow-water and deep-water facies of the region of present-day carbonate sedimentation. A study was made to trace the lithological-geochemical conditions promoting oil formation in Mesozoic rocks of the southeastern Caucasus. (Josefson-USGS)
W74-05021

MIGRATION OF ELEMENTS IN RIVER WATERS (MIGRATSIYA ELEMENTOV V RECHNYKH VODAKH),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
I. Yu. Lubchenko, and I. V. Belova.
Litologiya i Poleznyye Iskopayemyye, No 2, p 23-29, March-April 1973. 4 tab, 11 ref.

Descriptors: *Geochemistry, *Trace elements, Movement, Rivers, *Dissolved solids, *Suspended solids, Suspension, Turbidity, Colloids, Oxides, Sorption, Filtration, Particle size, *Path of pollutants, Pollutant identification.
Identifiers: *USSR(Black Sea basin).

A study was made of migration of Ti, Fe, Mn, P, Zr, W, Cr, Ni, V, Co, Cu, Pb, Mo, Ga, and Zn in rivers of the Black Sea basin in 1968. Suspended and dissolved solids were separated by filtration through F-5 bacterial filters. The filtrate obtained showed no signs of opalescence, indicating complete separation of the suspended materials, including colloids. Analysis of grain-size distribution of river-water suspensions showed no direct relationship between the content of a given fraction and the general turbidity of water. Topography of the catchment area had little effect on grain-size distribution of the suspensions. Ti, Zr, Cr, and V showed a distinct tendency to accumulate in coarser fractions and Mn, Fe, Ni, Cu, Mo, W, Pb, and Zn in finer fractions. The concentration of elements in solution depends on the general turbidity of water. The migration of elements in solution is affected by sorption processes. The importance of sorption is demonstrated by the removal of amorphous iron and manganese oxides from the samples. Modes of migration of the elements are determined not only by whether the particular element migrates in solution or in suspension but also by the element's sorption activity. (Josefson-USGS)
W74-05022

BASIC PATTERNS IN THE DISTRIBUTION OF CHEMICAL ELEMENTS IN DEEP-SEA SEDIMENTS OF THE BLACK SEA (OSNOVNYYE ZAKONOMERNOSTI RASPREDELENIYA KHIMICHESKIKH ELEMENTOV V TOLSHCHE GLUBOKOVODNYKH OSADKOV CHERNOGO MORYA),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
I. I. Volkov.
Litologiya i Poleznyye Iskopayemyye, No 2, p 3-22, March-April 1973. 6 fig, 4 tab, 52 ref.

Descriptors: *Geochemistry, *Trace elements, *Distribution patterns, *Sedimentology, *Bottom sediments, Bottom sampling, Inorganic compounds, Metals, Organic compounds, Organic matter, Recent epoch, Correlation analysis, Water pollution sources.
Identifiers: *USSR(Black Sea), Mediterranean Sea, Organic carbon, Oozes, Sapropel.

A study was made of the vertical distribution of Fe, Mn, Ti, P, Cu, Ni, Co, V, Cr, Mo, W, Zr, Se, Ge, U, $CaCO_3$, and organic C in deep-sea sediments of the Black Sea. The distribution of chemical elements observed in Black Sea sediments is the result of a complex and many-sided geochemical evolution of the basin from Neoeuxinian to Recent time. Unlike the Neoeuxinian deposits, the change in concentrations of elements in Old Black Sea and Recent sediments, reflected in their enrichment in $CaCO_3$, organic matter, and the group of geochemically mobile elements and in their impoverishment in Mn and relatively immobile elements, is due to a number of factors. The most important factor is the weakening of the hydrodynamic regime, which, as a result of intensified differentiation and diminution of the sedimentation rate in deep-sea sediments, has led to a change in the concentration of all elements in the observed direction. Additional factors include increased contents of organic matter in the sediments, occurrence of hydrogen-sulfide contamination in water of the Black Sea, and inflow of Mediterranean waters through the Bosporus. (Josefson-USGS)
W74-05023

AN EVALUATION OF THE EFFECTS OF ESTUARINE ENGINEERING PROJECTS,
Texas Parks and Wildlife Dept. Austin.
R. B. Johnson, Jr.
Available from NTIS as COM-72-11170, price $3.00 in paper copy, microfiche $1.45. Completion Report for Period April 1966 - March 1970, July 1970. 136 p, fig, ref. NOAA 2-12-R.

Descriptors: Texas, *Animal habitats, Fisheries, Ecology, *Coastal engineering, *Powerplants, *Harbors, Levees, *Hurricanes, *Electric power, *Water pollution sources.
Identifiers: Gulf Coast, Ecosystems.

The following were studied: the effects of habitat modification on the fishery ecology of Ceda

Bayou, Texas; the effects of engineering projects on the ecology of Jones Bay, Texas; the effects of engineering projects on the ecology of Moses Lake, Texas; and the effects of habitat modification on the fishery ecology of Trinity Bay, Texas. Studies were set up to determine the extent and quality of nursery environment for commercial and recreational fishery species, and to examine related environmental features, before, during and following construction or habitat modification where possible. Various gear were used to sample the biota. Major types used were bag seines (minnow seines), bar seines, drag seines, otter trawls, marsh nets and plankton two nets. Other samples were taken with Ekman dredge, core tubes, and by hand. Hydrographic studies included sampling for salinity, temperature, turbidity and dissolved oxygen. (Sinha - OEIS)
W74-05038

DISSOLVED OXYGEN AND IRON IN SHALLOW WELLS AT SALISBURY, MD.,
Geological Survey, Towson, Md. Water Resources Div.
S. G. Heidel.
Journal American Water Works Association, Vol 57, No 2, p 239-244, February, 1965. 1 fig, 2 tab, 3 ref.

Descriptors: Wells, *Water wells, Water resources, *Water supply, *Groundwater, Aquifer characteristics, *Iron bacteria, Pollutants, Corrosion, *Oxidation-reduction, *Dissolved oxygen, Hydrogen ion concentration, Pollutant identification.
Identifiers: *Salisbury(Md.), 'Red water', Well efficiency, Production decline.

In September 1962, U.S. Geological Survey was asked to appraise the water resources of the Salisbury, Md., area. The first phase of the study was concerned with an apparent iron problem in the city well field. The municipal supply is obtained from sixteen shallow wells drilled adjacent to Beaverdam Creek. The principal recharge of the producing aquifer, or water-bearing zone, is from surface water sources, including Beaverdam Creek and ponds in the creek created by low dams, and from precipitation that infiltrates the porous soil of the area. Many communities using ground water as their source of supply have reported problems that are similar in some respects to those in the Salisbury wells. Basically, the reported symptoms are that yields of the municipal wells have been decreasing; a thick coating of material resembling iron oxide has been observed on the interior of the pump discharge lines of some wells; periodic analyses of water samples from the wells have revealed increases in total solids; and there have been complaints from some water users that 'dirty' or 'rusty' water is coming from their taps. Several hypotheses for the problems were derived. The methods of investigation, results and conclusions are presented. (Hunt-NWWA)
W74-05078

EFFECT OF WATERSHED AREA OIL FIELDS ON WATER QUALITY,
Shreveport Dept. of Water and Sewerage, La.
A. A. Hirsch.
Journal American Waterworks Association, Vol 56, No 11, p 1474-1480, November, 1964. 6 fig, 3 tab, 3 ref.

Descriptors: Wells, Oil wells, *Water quality, *Water supply, Pollution, *Oil wastes, Saline water, *Flow augmentation, Hardness, Public health, Legislation, *Louisiana, Municipal water.
Identifiers: *Shreveport(La.), Cross Lake(La.), Brine production, Oil field pollution.

Shreveport has drawn its municipal water supply from nearby Cross Lake since January 1926. Its watershed covers 264 sq mi, 63 per cent lying in the western part of Caddo Parish, La., and 37 percent in the eastern part of Harrison County, Texas. In this drainage area are located two important oil fields that extend across the Texas-Louisiana border. As oil production grew in the Cross Lake runoff areas, the quality of the streamflow, as reflected in the salt concentration of the lake water, suffered. Clearly evident from official records is the increasing salt concentration, with recent levels above 150 ppm NaCl far exceeding earlier levels of 15-30 ppm. Waste petroleum brines are characteristically high in salt, with only insignificant amounts of other compounds commonly found in natural waters. The increasing values of the salt to alkalinity ratio establish oil well wastes as the pollutant. Shreveport's various sources of water supply are all intimately connected with the extent of oil well brine releases within their respective watersheds. Unless considerable reduction in the salinity of raw-water supplies is soon apparent, efforts will be required to enact sweeping mandatory regulations for injection. This practice has been adopted under state or federal insistence in other areas, some of them of far less importance than is a metropolitan water supply. (Hunt-NWWA)
W74-05079

GROUNDWATER IN PAPUA NEW GUINEA,
Geological Survey of Papua New Guinea, Port Moresby.
For primary bibliographic entry see Field 4B.
W74-05084

REPORT OF THE POLLUTION COMMISSION, PART II: COLLABORATION BETWEEN THE WATER AND OIL INDUSTRIES,
H. Jagger, and L. H. Brown.
In: Eighth Congress of the International Water Supply Association, September 1-5, 1969, Vienna, Austria, p Z25-Z31, (1969). 4 ref.

Descriptors: *Water pollutant sources, Water pollution, *Water pollution control, Oil, *Oil spills, Oily water, Public health, Pipelines, *Oil industry.
Identifiers: *Great Britain.

Although public health and river pollution considerations have given rise to legislation relating to the discharge of harmful and obnoxious effluents over the past century, pollution of fresh water resources by oil is a relatively recent concern. The pipelines, from the mid-1950's, resulted in increased concern by water supply authorities that water pollution of considerable magnitude might result from the failure of one such line. This conference underscores the joint activities of the water and oil industries that have been useful in providing a better mutual understanding of the problems involved and in suggesting steps which are reducing the risks and consequences of pollution of water resources by oil. (Staplin-NWWA)
W74-05094

GROUND WATER SUPPLIES OF NORTHEASTERN ILLINOIS -- QUALITY PROBLEMS WITH WELL WATERS,
Illinois State Water Survey, Urbana. Chemistry Section.
T. E. Larson.
Journal American Water Works Association, Vol 56, No 2, p 169-172, February 1964.

Descriptors: Wells, *Water wells, *Water supply, Water quality, Aquifer characteristics, *Groundwater pollution, Odor, Taste, *Water quality control, *Illinois, *Iron, Hydrogen sulfide, Chlorides.
Identifiers: *Galvanic corrosion, Galesville sandstone, Galena-Platteville formation.

Most problems in well water quality are inherent and not receptive to correction by any means other than external treatment. These problems are usually related to the natural hardness or iron content of the water from the aquifer or from one of the contributing aquifers. Perhaps the most annoying problems are due to the iron content of the water. At times the occurrence of such problems is inexcusable or may be condoned only because of lack of information or adequate interpretation of information. Another less frequently encountered but more objectionable problem is that of hydrogen sulfide in well waters. This 'rotten-egg' odor almost always demands treatment. Case studies of these problems, their causes and corrective measures taken in 3 aquifers are presented. It is concluded that in many cases the pollutants enter the well from outside the producing zone due to improper or nonexistent sealing; however, it should be remembered that preventive measures taken during construction are usually superior to and less costly than corrective measures. (Hunt-NWWA)
W74-05100

WORKBOOK OF THERMAL PLUME PREDICTION: VOLUME 1, SUBMERGED DISCHARGE,
Pacific Northwest Water Lab., Corvallis, Oreg.
M. A. Shirazi, and L. R. Davis.
Copy available GPO Sup Doc as EP1.23/2:72-0053, $1.75; microfiche from NTIS as PB-228 293, $1. 5. Environmental Protection Agency, Technology Series Report EPA-R2-72-005a, August 1972. 228p, 8 fig, 12 tab, 7 ref. EPA Project 16130.

Descriptors: *Jets, *Thermal pollution, Publications, *Discharge(Water), *Distribution patterns, Water pollution effects, Heated water, Forecasting, Water pollution sources.
Identifiers: Submerged jets, *Nomograms, *Thermal plumes, *Submerged discharge.

This workbook contains computational procedures in the form of nomograms designed to satisfy several needs related to the discharge of thermal waste into large bodies of water. They provide estimates of physical spread and temperature distribution around the discharge point for the assessment of biological and physical effects of heated water. They can be used as guidelines for setting temperature standards and for monitoring. Finally, they have utility in pre-design feasibility analyses and outfall performance estimates. Data and analyses from numerous sources constitute the backup material for this publication. An attempt has been made to unify and present the material in a format that is sufficiently simple for a non-specialist user. A number of illustrative examples are presented which demonstrate the use of each set of nomograms in practical problems. The status of analysis at this time is not sufficiently advanced to encompass a wide range of experimentally verified predictive models. For this reason, care must be exercised when applying the generalized nomograms to specific situations. The major restrictions for each set of nomograms are outlined in the text which the user is advised to review carefully. In general, the nomograms provide meaningful qualitative information for a wide range of problems of practical interest, but their use is subject to scrutiny and proper interpretation when applied to exacting design conditions. (EPA)
W74-05111

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME I. COPPER, ZINC, AND LEAD INDUSTRIES,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5D.
W74-05116

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME II. ALUMINUM, MERCURY, GOLD, SILVER, MOLYBDENUM, AND TUNGSTEN,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 5D.
W74-05117

REGRESSION TECHNIQUES FOR ESTIMATION OF SULFATE IN STREAMS DRAINING AN AREA AFFECTED BY COAL MINING,
Geological Survey, Louisville, Ky. Water Resources Div.
H. F. Grubb, and P. D. Ryder.
In: Proceedings of 3rd Annual Environmental Engineering and Science Conference, March 5-6, 1973, Louisville, Ky: University of Louisville Speed Scientific School, p 127-137, 1973. 7 fig, 2 tab, 2 ref.

Descriptors: *Regression analysis, *Monitoring, *Sulfates, *Acid mine water, *Coal mines, Mine acids, Data processing, Statistical methods, *Kentucky.
Identifiers: *Tradewater River basin(Ky).

The Tradewater River basin above the U.S. Geological Survey stream-gaging station at Olney, Ky., has been extensively mined for coal by both underground and strip-mining methods. A relationship between specific electrical conductance (X) and sulfate concentration (Y) can be represented by a simple linear regression equation of the form $Y = a + bX$. The regression coefficients a and b were determined using data from 465 chemical analyses made over a 17-year period at the Olney Station. Reduction of the standard error of about 40% was achieved by removing 16 data points representing water anomalously high in bicarbonate and associated with rainfall and runoff from the western, nonmined portion of the basin. Sulfate concentration, estimated from specific conductance measurements and the relationships $\log Y = -1.015 + 1.242 \log X$, was compared to the sulfate concentration in 96 water samples collected from the Tradewater River at Olney since 1966. The maximum error of prediction was 26%, and 89% of the estimated values were within 10% of the observed sulfate concentrations. The long-term effects of coal mining on stream water chemistry can be monitored with specific conductance and only a limited number of chemical analyses to verify the stability of the sulfate-conductance relationship. (Knapp-USGS)
W74-05125

NUMERICAL MARCHING TECHNIQUES FOR FLUID FLOWS WITH HEAT TRANSFER,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 8B.
W74-05128

POSSIBLE CAUSE OF FORMATION OF HORIZONTAL HYDROGEOCHEMICAL ZONALITY OF GROUNDWATER IN CENTRAL KAZAKHSTAN (O VOZMOZHNOY PRICHINE VOZNIKNOVENIYA GORIZONTAL'NOY GIDROGEOKHIMICHESKOY ZONAL'NOSTI PODZEMNYKH VOD V TSENTRAL'NOM KAZAKHSTANE),
Leningrad State Univ. (USSR).
For primary bibliographic entry see Field 2F.
W74-05147

EFFECT OF EXCESS MOISTURE ON TRACE ELEMENT DISTRIBUTION IN SOILS OF LININGRAD OBLAST (O VLIYANII IZBYTOCHNOGO UVLAZHNENIYA NA RASPREDELENIYE MICKROELEMENTOV V POCHVAKH LENINGRADSKOY OBLASTI),
Liningrad State Univ. (USSR).
For primary bibliographic entry see Field 2G.
W74-05148

MICROBIAL DEGRADATION OF PETROLEUM IN CONTINENTAL SHELF SEDIMENTS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
P. G. Hunt, F. R. Koutz, R. P. Murrmann, and T. G. Martin.
Special Report 196, December 1973. 16 p, 5 fig, 2 tab, 38 ref, append.

Descriptors: *Oil spills, *Contential shelf, *Biodegradation, *Path of pollutants, Bottom sediments, Oil pollution, Aerobic conditions.

A study was conducted to determine whether petroleum waste products deposited in surficial sediments of the United States Continental Shelf would be subject to microbial degradation. Degradation of these waste products should occur under the aerobic conditions commonly present in the sediments, but under anaerobic conditions, degradation of hydrocarbons should be extremely slow. It was verified, using carbon-14 labeled hydrocarbons, that degradation of petroleum in sediments occurs when oxygen is very limited; however, several hundred years would be required for complete degradation to occur. (Knapp-USGS)
W74-05153

MIXTURE, A COMPUTER PROGRAM FOR THE CALCULATION OF HOT WATER TEMPERATURE AND MIXING FRACTIONS OF LARGE VOLUME WARM SPRINGS OF MIXED WATER ORIGIN,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W74-05156

ENVIRONMENTAL ACTIVITIES AND PROGRAMS AT THE SAVANNAH RIVER PLANT.
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
Available from NTIS, Springfield, Va., as Rept. No. DPST-73-436, $4.00 per copy, $1.45 microfiche. Report No. DPST-73-436, Sept. 1973. 23 p.

Descriptors: *Environment, *Monitoring, *Radioactivity, Rivers, *Nuclear powerplants, Nuclear wastes, Effluents, Streams, Administration, Standards, Regulation, Water pollution safety, Public health, Ecology, Forests, Limnology, Meteorology, Fuel, Fabrication, Radioactive waste disposal, Food chains, Transport depletion, *South Carolina.
Identifiers: *Savannah River(So Car).

The Savannah River Plant consists of three operating nuclear production reactors, two separations areas for processing irradiated materials, a heavy water extraction and recovery plant, reactor fuel fabrication facilities, the Savannah River Laboratory (a process development laboratory to support production operations), and the many non-nuclear facilities necessary for plant operations. The purpose and operation of the plant activities and the funded programs to modify the impact of potential or actual releases to the environs are described. Inasmuch as the plant processes are quite complex, this report does not describe any of the activities in depth nor does it delineate in detail the results of the various emission controls, environmental research, and environmental monitoring programs. Rather, the report gives general descriptions of these activities. For fiscal year 1974, the operating budget for the plantsite is about $125 million; about 10% of this amount is spent for environmentally oriented activities. (Houser-ORNL)
W74-05173

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT, (HEALTH AND SAFETY LABORATORY, AEC, NEW YORK),
Health and Safety Lab. (AEC), New York.
For primary bibliographic entry see Field 5A.
W74-05174

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT - JUNE 1, 1973, THROUGH SEPTEMBER 1, 1973, APPENDIX,
Health and Safety Lab. (AEC), New York.
For primary bibliographic entry see Field 5A.
W74-05175

RADIOLOGICAL EVALUATIONS FOR ADVANCED WASTE MANAGEMENT STUDIES,
Battelle-Pacific Northwest Labs., Richland, Wash.
D. H. Denham, D. A. Baker, J. K. Soldat, and J. P. Corley.
Available from NTIS, Springfield, Va., as Report No. BNWL-1764. $5.45 per copy, $1.45 microfiche. Report No. BNWL-1764, Sept. 1973. 71 p, 7 fig, 22 tab, 28 ref, 6 append.

Descriptors: *Radioactive waste disposal, *Nuclear powerplants, Effluents, *Air pollution, *Water pollution, Soil contamination, Management, Regulation, Social aspects, Public health, Benefits, Cost-benefit analysis, Cost-benefit theory, Radioisotopes, Strontium, Cesium, Model studies, Mathematical models, *Computer models.

The overall risk evaluation for various radioactive waste management concepts includes calculations of radiation doses to individuals and local populations. Radiation doses are the most appropriate measure of the consequences of unforeseen releases of radioactive materials to the environment and dose criteria are available by which the severity may be judged. A comprehensive dose computational model, developed and used for other Atomic Energy Commission studies, has been adopted to improve its flexibility and to assist in evaluating alternative means for disposal of high-level waste. Typical input terms for normal use include source terms (radionuclide release rates to man's immediate environment) and dilution factors. Outputs include individual pathway doses and total doses to maximum individuals for both an urban and a rural population. Whole body doses plus doses to other critical organs are obtained, as well as the fractional dose contribution of individual nuclides. Doses for one year or total doses for fifty years of exposure are available. (Houser-ORNL)
W74-05176

ENVIRONMENTAL MONITORING. ANNUAL REPORT, 1972, (ATOMICS INTERNATIONAL)
Atomics International, Canoga Park, Calif. Health, Safety and Radiation Services Dept.
J. D. Moore.
Available from NTIS, Springfield, Va., as Report TID-26442, $4.00 per copy, $1.45 microfiche. Report TID-26442, 1972. 27 p, 7 fig, 8 tab, 3 ref, 3 append.

Descriptors: *Monitoring, *Environment, *Background radiation, *Radiation, *Nuclear explosions, Safety, Toxicity, Public health, Soils, Vegetation, Water, Air, Survey, Measurement.
Identifiers: *Weapons testing.

Environmental monitoring at Atomics International is performed by the Operational Safety and Waste Management Unit of the Health, Safety and Radiation Services Department. Soil, vegetation, water, and air are routinely sampled up to a distance of 10 miles from Atomics International sites. Site perimeters are monitored for radiation levels by means of thermoluminescent dosimeters. The environmental radioactivity reported herein is attributed to natural causes and to nuclear weapons testing, rather than to Atomics International operations. The environmental monitoring program provides a measure of the effectiveness of the Company's radiological safety procedures and of engineering safeguards incorporated into facility designs. (Houser-ORNL)
W74-05177

LOW-LEVEL RADIOACTIVITY MEASUREMENTS,
National Bureau of Standards, Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-05178

RADIOLOGICAL SURVEY OF THE AREA SURROUNDING THE ELK RIVER REACTOR, ELK RIVER, MINNESOTA.
EG and G., Inc., Las Vegas, Nev. Aerial Surveillance Dept.
Available from NTIS, Sprinfield, Va., as Rept. No. EGG-1183-1591, $4 per copy, $1.45 microfiche. Report No. EGG-1183-1591, May 1, 1973. 21 p, 3 fig, 3 tab, 3 ref.

Descriptors: Survey, *Radioactivity, *Measurement, *Air pollution, Water pollution, *Water pollution sources, Soil contamination, Nuclear powerplants, Effluents, Public health, *Remote sensing, *Minnesota.
Identifiers: *Elk River(Minn).

The Aerial Radiological Measuring System (ARMS) was used to survey the area surrounding the Elk River experimental power reactor during August and September 1968. The survey measured terrestrial gamma radiation. A high-sensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 900 square mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal terrestrial background radiation. (Houser-ORNL)
W74-05179

GENERAL ENVIRONMENTAL SITING GUIDES FOR NUCLEAR POWER PLANTS -- TOPICS AND BASES, (DRAFT).
Directorate of Regulatory Standards (AEC), Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05180

RADIONUCLIDES IN ECOSYSTEMS, VOLUME I.
Oak Ridge National Lab., Tenn.
Available from NTIS, Springfield, Va., as CONF-710501, Proceedings, Vol. 1, $13.60 per copy, $1.45 microfiche. Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, D. J. Nelson, Editor. Report CONF-710501-P1, (1971), 678p.

Descriptors: *Ecosystems, *Radioecology, *Radioisotopes, Ecology, Radioactivity, *Path of pollutants, *Environmental effects, Assay, Measurement, Water pollution, *Monitoring.

Contents of volume I are divided into eight parts: Plenary Session Papers; Radionuclides in Terrestrial Ecosystems; Radionuclides in Freshwater Ecosystems; Thermal Effects Studies; Radionuclides in Marine Ecosystems; Models of Radionuclides in Ecosystems; Effects of Ionizing Radiation on Plants and Plant Communities; and Effects of Ionizing Radiation on Species and Populations. (See also W74-05182 thru W74-05212)
W74-05181

AN ECOLOGICAL APPROACH TO THE EVALUATION OF RADIOACTIVITY WITHIN THE MAN-ENVIRONMENT ECOSYSTEM,
Emory Univ., Atlanta, Ga.
R. B. Platt, H. L. Ragsdale, and D. J. Shure.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971. Oak Ridge, Tennessee, (1971) p 9-17, 5 fig.

Descriptors: *Radioactivity, *Environment, *Ecology, *Evaluation, Assay, *Measurement, Appraisals, Assessment, *Ecosystems, Quality control, Forecasting, Balance of nature, Eurthrophication, Food chains, Biota, Biorhythms, Computer programs, Data storage and retrieval, Meteorology, Hydrology.

Both a philosophy and a plan of action are are presented for an ecosystem approach to the measurement and evaluation of radioactive nuclides in the environment. Methods currently in use are generally restricted to an analysis of those environmental components directly related to man. Yet man's welfare depends also on the long-range quality of his total environment. For example, it is becoming apparent that negative feedbacks to man originate in natural systems. Thus, the prediction and discovery of trends of environmental change must be based on the entire network of trophic and subsystem transfers. Irreversible environmental problems usually arise through couples among biotic subsystems. Reversals of potential threats to man are least expensively made by understanding and regulating inputs to natural systems. Changes become irreversible or expensively reversible when detected in food chains coupled directly to man. Food chains are treated functionally as natural, recreational, and domestic, with each of these assigned to the primary environmental components, including man. Computer programming provides for data storage, systems analysis of the data with respect to base lines and trends, and both tabular and graphic data displays. (See also W74-05181) (Houser-ORNL)
W74-05182

RADIONUCLIDES IN THE ENVIRONMENT AT NUCLEAR POWER STATIONS,
Environmental Protection Agency, Cincinnati, Ohio. Radiochemistry and Nuclear Engineering Branch.
B. Kahn.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 30-36, (1971), 1 fig, 4 tab, 10 ref.

Descriptors: *Radioactivity, *Environment, *Nuclear powerplants, Effluents, Ecology, *Radioecology, Monitoring, Ecosystems, Aquatic life, Air pollution, Water pollution, Public health, *Path of pollutants, Survey, Assay, Measurement, Food chains.
Identifiers: *Surveillance program.

The radionuclides that can be found in the environment of commercial nuclear power stations are indicated, problems of environmental surveillance are discussed, and topics of radioecological research in this area are suggested. The information on radionuclides in the environment is derived from radionuclide release data and routine environmental monitoring by the stations and from field studies at several stations. The results show that several radionuclides are readily detectable in the aquatic ecosystem at many or all stations. Measurement of radioactive gases in ground-level air at several stations can be used to determine dispersion of stack effluents in air. Little or no radioactivity from the stations has been found in the terrestrial ecosystem. (See also W74-05181) (Houser-ORNL)
W74-05183

ENVIRONMENTAL ASPECTS OF NATURAL GAS STIMULATION EXPERIMENTS WITH NUCLEAR DEVICES,
California Univ., Livermore. Lawrence Livermore Lab.
L. R. Anspaugh, J. J. Koranda, and W. L. Robison.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 37-52, (1971) 5 fig, 10 tab, 58 ref.

Descriptors: *Environment, *Natural gas, *Secondary recovery(Oil), Benefits, Cost-benefit ratio, *Air pollution, Water pollution, Food chains, Public health, Food, Milk, Vegetation, Path of pollutants, Tritium, Krypton radioisotopes, *Radioecology, *Nuclear explosions, Computer models.
Identifiers: Project Rulison.

It is likely that future activities administered by the USAEC Division of Peaceful Nuclear Explosives will be in the area of underground engineering, and particularly in the stimulation of deeply buried natural gas reservoirs of low permeability. The successful development of this technology could double the proved recoverable resources of natural gas in the United States. During the developmental stage of the technology, large quantities of THO are released to the environment as the gas is withdrawn. Efforts to predict potential doses resulting from such releases have been severely handicapped by the lack of adequate data to predict the ecological movement of THO. A radio-ecological study was conducted in conjunction with Project Rulison, the second nuclear-stimulation experiment, to evaluate these parameters; controlled laboratory studies were also initiated. The results indicate that the environmental residence time of THO is at least an order of magnitude shorter than has been frequently assumed, and that this invalidates the commonly used deposition velocity approach for the calculation of doses due to food chain contamination by THO vapor. A simple but realistic model is developed based on these findings to predict the dose to man via the forage-cow-milk, forage-cattle-beef, vegetation, and inhalation pathways. The dose predicted by this model for the Rulison area residents is 10 to the third power to 10 to the fourth power lower than the preflaring estimates made by a variety of organizations. (See also W74-05181) (Houser-ORNL)
W74-05184

THE YEAR 2000 -- NUCLEAR POWER AND MAN,
Division of Reactor Development and Technology (AEC), Washington, D.C.
S. Strauch.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 53-62, (1971) 15 fig.

Descriptors: *Nuclear powerplants, *Radioactivity, Effluents, *Environment, Assessment, *Forecasting, River basins, Mississippi River, Missouri River, Ohio River, Lake Michigan, *Path of pollutants, Food, Water, Food chains, Population, Public health, Computer programs, Model studies, *Computer models.

A study was initiated by AEC in January 1970 to develop a computer model and necessary data to permit estimates of potential doses and dose commitments to individuals and population groups as a result of selected release rates from reactors and fuel reprocessing plants in a large geographic region. The model is of the sophistication warranted for 30 years forecasting purposes and of sufficient generality and scope to permit it to eventually encompass the contiguous United States. The study is being conducted by the Hanford Engineering Development Laboratory at Richland, Washington, with the assistance of Battelle Memorial Institute under the direction of the AEC Division of Reactor Development and Technology and the Director of Regulation. The model is being applied initially to the Upper Mississippi River Basin for the nuclear facilities which are projected to be located in that region by the year 2000. Exceptional care is being taken to ensure that all radionuclides and their associated pathways that lead to significant doses are included in this initial development phase of the model. (See also W74-05181) (Houser-ORNL)
W74-05185

AEC IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT IN ITS LICENSING AND REGULATION OF NUCLEAR FACILITIES,
Division of Radiological and Environmental Protection (AEC), Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05186

GAMMA-EMITTING RADIONUCLIDES IN ALASKAN ENVIRONMENTS 1967-1970,
California Univ., Livermore. Lawrence Livermore Lab.
J. J. Koranda, and J. R. Martin.
In: CONF-710501-P1 -- Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 81-107, (1971) 5 fig, 19 tab, 23 ref.

Descriptors: *Environment, *Sampling, *Radioactivity, *Assay, *Measurement, Evaluation, Safety, Air pollution, Water pollution, Soil contamination, Vegetation, Lichen, Fallout, Cesium, Nuclear explosions, Radioisotopes, *Alaska.
Identifiers: China, *Amchitka Island(Alas).

Environmental samples were collected at several sites in Alaska to determine the present status of radionculides in Alaskan environments, with special emphasis on Amchitka Island. Samples were obtained on Amchitka Island, the coastal Alaska near Anchorage, and in central Alaska in the Fairbanks area. Lichens, grasses, herbs, and shrubs were collected along the Amchitka Island to Fairbanks transect of Alaskan environments. Radionuclide concentrations were determined by scintillation crystal and solid-state gamma spectroscopy. Cesium-137 was the most abundant radionuclide found in the northern environments, with low but detectable concentrations of Eu-155, Sb-125, Ce-144, and Mn-54 also being present. Fallout from recent Chinese tests produced increased levels of Zr-95/Nb-95 in the 1970 samples. Lichens have the highest concentrations of Cs-137, but evergreen vascular plants also had Cs-137 concentrations in the same range as those found in lichens. Plants with an annual topgrowth, such as grasses, had low to nondetectable concentrations of radionuclides. These data describe radiometric base lines pertinent to current testing programs being conducted in the Aleutian Islands and relate those base lines to those occurring elsewhere in the high latitudes. (See also W74-05181) (Houser-ORNL)
W74-05187

RECENT MEASUREMENTS OF CESIUM-137 IN RESIDENCE TIME IN ALASKAN VEGETATION,
California Univ., Livermore. Lawrence Livermore Lab.
J. R. Martin, and J. J. Koranda.
In: CONF-710501-P1, Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 108-115, (1971) 5 fig, 1 tab, 25 ref.

Descriptors: *Monitoring, *Measurement, *Cesium, *Vegetation, *Lichens, Ecology, Ecosystems, Water pollution, Fallout, Sampling, Assay, Data collections, Radioecology, Absorption, Cycles, Food chains, Public health, Radioisotopes, *Alaska, *Path of pollutants.
Identifiers: Residence half-time, Aleutian Islands(Alas), Anchorage(Alas).

Radionuclide concentrations in Alaskan plant species were measured in the period 1967-1970 when incoming fallout was a small fraction of the accumulated inventory present in the vegetation. Samples were collected in five geographic areas from the western Aleutians to the interior of Alaska. Radionuclide concentrations in 150-g aliquots of dried, ground, and compressed samples were measured by scintillation gamma spectrometry. The residence half-time for Cs-137 in Cladonia sp. lichens was approximately three years on Amchitka Island and the coastal area near Anchorage, Alaska. In central Alaska near Fairbanks and in the mountains near Anchorage, the residence half-time for Cs-137 in lichens was about eight years. Evergreen vascular plants from these higher elevation sites had residence half-times of only one to three years. (See also W74-05181) (Houser-ORNL)
W74-05188

RADIONUCLIDE BIOMAGNIFICATION IN COASTAL-PLAIN DEER,
Georgia Univ., Athens. School of Forest Resources.
J. H. Jenkins, and T. T. Fendley.
In: CONF-710501-P1 -- Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 116-122, (1971) 5 fig, 4 tab, 14 ref.

Descriptors: *Monitoring, Measurement, *Radioisotopes, *Cesium, *Strontium, *Deer, Southeast region, Fallout, Water pollution, Absorption, Food chains, Public health, Radioecology, Vegetation, Bioindicators, Biology, Bioassay, Atlantic Coastal Plain, Gulf Coastal Plain.
Identifiers: *Bioaccumulation.

Muscle samples have been obtained from over 1000 deer throughout the Southeast during the past five years and analyzed for radionuclides. Deer from the Lower Coastal Plain region had consistently higher levels of Cs-137 than deer from the Upper Coastal Plain, Piedmont, Central Plateau, and Mountain regions. In the Lower Coastal Plain, deer muscle average 45,000 pCi/kg of Cs-137, with some specimens ranging up to over 150,000 pCi/kg. Animals from the other provinces averaged around 4000 pCi/kg. Evidence that Sr-90 is effectively transported through the Lower Coastal Plain environment also. Strontium values in deer were comparable to the values found in Arctic herbivores, while the Cs-137 values are higher than were found in the Arctic. Potassium deficiency in vegetation probably increases radionuclide bioaccumulation. Cropland vegetation is 20X higher in potassium and has only 1 to 3% as much radioactive cesium as forest and swampland vegetation. Bioaccumulation in wildlife may well become a classic example of radionuclide cycling. Data indicate that the sterile, sandy soils of the Lower Coastal Plain in combination with high water tables and some specific radionuclide-concentrating plants produce the conditions which result in biomagnification of Cs-137 and Sr-90 in deer. (See also W74-05181) (Houser-ORNL)
W74-05189

CESIUM-137 IN WHITE-TAILED DEER AS RELATED TO VEGETATION AND SOILS OF THE SOUTHEASTERN UNITED STATES,
Eastern Environmental Radiation Lab., Montgomery, Ala.
S. L. Cummings, J. H. Jenkins, T. T. Fendley, L. Bankert, and P. H. Bedrosian.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 123-128, (1971) 1 fig, 4 tab, 15 ref.

Descriptors: *Monitoring, *Measurement, *Cesium, *Deer, *Southeast U.S., Vegetation, Soils, Radioecology, Sands, Assay, Soil analysis, Leaching, Ion transport, Soil water, Absorption, Atlantic Coastal Plain, Gulf Coastal Plain.

Data are presented for Cs-137 in white-tailed deer and vegetation of the southeastern United States along with information as to the nature of the associated soils. The concentrations of Cs-137 in some of the vegetation were of sufficient magnitude to account for the Cs-137 concentrations found in the deer. The highest Cs-137 concentrations in deer were associated with the humic-gley soils along the Atlantic and Gulf Coasts. These soils are predominately sandy in nature and have relatively low fixing capacities. The concentrations of Cs-137 in the vegetation grown on the humic-gley soils under natural and controlled conditions were greater than from the gray-brown podzolic and red-yellow podzolic soils. (See also W74-05181) (Houser-ORNL)
W74-05190

DISTRIBUTION OF CESIUM-137 IN A SMALL WATERSHED IN NORTHERN MISSISSIPPI,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. C. Ritchie, J. R. McHenry, A. C. Gill, and P. H. Hawks.
In: CONF-710501 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 129-132, (1971) 2 fig, 4 tab, 11 ref.

Descriptors: *Fallout, *Cesium, *Monitoring, Measurement, *Watersheds(Basins), *Mississippi, Distribution, Sediment distribution, Ecological distribution, Model studies, Hydrologic data, Hydrologic models, Movement, Diffusion, Dispersion, Transfer, Sediment transport, Entrainment, Path of pollution, Erosion.

Concentration of fallout Cs-137 in soils and sediments of a small watershed in north Mississippi was measured to determine the redistribution of fallout Cs-137. Measured concentration of Cs-137 ranged from 8.9 nCi/sq m in soils from actively eroding areas to 412.2 nCi/sq m in conservation pool sediments. A model was constructed for the distribution of Cs-137 in the watershed. Sixty-one percent of the Cs-137 in the conservation pool sediments was derived from the movement of Cs-137 from the contributing watershed. Of the Cs-137 moved from the watershed, 53% was contributed from the eroded areas which presently occupy 4% of the contributing watershed area. The efficiency of the reservoir for trapping or retaining Cs-137 carried into it from runoff was 57%. Of the total Cs-137 deposited in the watershed, less than 7% moved from the contributing watershed and only 3% of the Cs-137 deposited in the watershed moved through the reservoir outlets. (See also W74-05181) (Houser-ORNL)
W74-05191

A PROPOSED MECHANISM FOR THE RECYCLING OF RADIOCESIUM IN FLORIDA SOIL PLANT SYSTEMS,
Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5A.
W74-05192

CESIUM-137 SOIL INVENTORY OF A TAGGED LIRIODENDRON FOREST 1962 AND 1969,
Oak Ridge National Lab., Tenn.
C. W. Francis, and T. Tamura.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 140-149, (1971), 5 fig, 9 tab, 14 ref.

Descriptors: *Cesium, *Absorption, *Soils, *Radioactive tracers, *Tracking techniques, *Path of pollutants, Absorption, Cycles, Forest, Forest soils, Root systems, Soil-water-plant relationships, Minerals, Sorption, Radioecology, Ecosystems, Ion exchange, Clays, Research and development.

The soil has become a major sink for Cs-137 innoculated into Liriodendron in 1962. The distribution of this radionuclide within the soil profile and among soil fractions was determined in soil samplings of late fall 1962 and summer 1969. The much higher concentractions of Cs-137 in the clay fraction (1962 samplings) at a soil depth of 6 cm (11.1 pCi/mg) as compared with that at 4 and 9 cm (4.8 and 1.1 pCi/mg respectively) indicates that most of the innoculated Cs-137 entered the soil through the roots rather than by transfer from rainfall or litter fall. This conclusion is also supported in that soil (< 0.250 mm) separated from fine roots by ultrasonics contained nearly twice the Cs-137 concentration of that separated from bark, small stones, etc. The 1969 soil sampling indicated that some downward accumulation of Cs-137 occurred after 1962; for example, the concentration at soil depth of 14 cm (0.67 pCi/mg) in 1969 was higher than the 0.31 pCi/mg determined at a

epth of 9 cm in 1962. Also, in the 1969 sampling here was no evidence of a Cs-137 concentrating henomenon at the 6-cm depth as there was in the 962 sampling. Separates obtained through density radient zonal centrifugation indicated greater han 90% of the Cs-137 on soil is associated with he mineral soil components. Of the mineral com-onent, the bulk of the Cs-137 appears to be as-ociated with the predominant soil clay minerals, aolinite and chlorite; however, there does seem o be a certain amount of selective concentration f Cs-137 in the micaceous minerals. (See also V74-05181) (Houser-ORNL)
V74-05193

ERSISTENCE OF RADIONUCLIDES IN SOIL, LANTS, AND SMALL MAMMALS IN AREAS ONTAMINATED WITH RADIOACTIVE FAL-OUT,
alifornia Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
. M. Romney, W. A. Rhoads, A. Wallace, and R. . Wood.
n: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-2, 1971, Oak Ridge, Tenn. p 170-176, (1971), 1 fig, tab, 32 ref.

Descriptors: *Radioecology, Radioactivity, Ecology, *Soil contamination, Small animals(Mammals), Fallout, Nuclear explosions, Cesium, *Strontium, Sorption, Testing, Movement, Abiotic environment, Biota, Biorhythms, Food chains, *Radioisotopes, Root systems.

The persistence of radionuclides in soil, plants, and small mammals was investigated periodically in areas contaminated with fallout from boveground nuclear detonations at the Nevada Test Site. Study sites were established at various ocations out to about 225 km from ground zero. Emphasis was placed upon the movement of Sr-90 nd Cs-137 from abiotic to biotic components. Several neutron activation products also were studied in fallout areas located within 5 km of nuclear xcavation tests. Radio-nuclides continued to be aken up through plant roots in small amounts, as ime progressed, and some continued to be leposited on foliage as resuspended dust particles. The inhalation route of entry became less important with passing time, whereas ingestion continued to be the most important route through which radionuclides entered small mammals living n old fallout areas. Long-lived Sr-90 accumulated primarily in bone tissue, while Cs-137 accumulated n muscle and soft tissue. Most of the neutron activation products are short-lived, but among those ound in animal tissues were isotopes of Co, Mn, nd W. Findings indicate that Sr-90 and Cs-137 will ontinue to move in small amounts from abiotic to iotic components in fallout-contaminated areas vith passing time. (See also W74-05181) (Houser-ORNL)
W74-05194

YCLING OF STABLE CESIUM IN A DESERT COSYSTEM,
alifornia Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
. Wallace, E. M. Romney, and R. A. Wood.
n: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-2, 1971, Oak Ridge, Tenn. p 183-186, (1971) 5 tab, 0 ref.

Descriptors: *Cesium, *Cycling, *Ecosystem, Deserts, Ecology, Radioecology, Activation nergy, Assay, Cycles, *Potassium, Soils, Plant athology, Mammals, Potassium radioisotopes, bsorption, Circulation, Movement, Dispersion, Path of pollutants.

Contents of stable Cs in several compartments of esert ecosystems represented at the Nevada Test ite have been determined by neutron activation. otassium in the same compartments has also been determined, and Cs:K discrimination under natural conditions has been evaluated. From compartment sizes some estimates have been made on the rates of Cs cycling through the systems. The rates were low, but the stable Cs was circulating. Compartments studied include soil, several different plant species, arthropods, reptiles, and mammals. The contents of Cs within compartments were in the nanogram per g of dry weight range. There appeared to be a progressive narrowing of the K/Cs ratio going from plants to reptiles and mammals. The addition of stable Cs as CsCl to a soil obtained from the Nevada Test Site resulted in leaf contents in Atriplex canescens of 0.0279, 0.580, 5.15, and 24.0 ppm per g of dry weight for application rates of 0,5, 20, and 50 ppm respectively. The applied Cs was slightly more available than was the original soil Cs. Stable Cs is freely circulated in ecosystems, although at levels lower than that of K by a factor of over 100,000. The stable Cs will have an influence in the cycling of Cs-137. (See also W74-05181) (Houser-ORNL)
W74-05195

ACCUMULATION OF CE-144 BY HICKORY AND CO-60 BY BLACK GUM SEEDLINGS,
Oak Ridge National Lab., Tenn.
W. A. Thomas.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 187-189, (1971) 2 tab, 7 ref.

Descriptors: Trees, *Hickory, *Radioisotopes, Absorption, Cycling nutrients, Foliar, Maple trees, Oak trees, Assay, Radioactivity, Soils, Plant-soil-water relationships, *Cobalt, Seeds, *Cesium.
Identifiers: *Blackgum seedlings, *Rare-earth elements, Seedlings.

Mockernut hickory (Carya tomentosa) trees accumulate the rare-earth elements, and black gums (Nyssa sylvatica) accumulate cobalt, resulting in foliar concentrations several orders of magnitude greater than those of other trees on the same site. To compare absorption rates, seedlings of these species and ones of red maple (Acer rubrum), tulip tree (Liriodendron tulipifera), and white oak (Quercus alba) were grown for 35 days in nutrient solution and in soil, both inoculated with Ce-144 and Co-60. The 'index of selective absorption,' defined here as the amount (dpm) of isotope transported to above-ground plant parts per 100 ml of nutrient solution absorbed by roots, compensates for differences among individuals in the volume absorbed. The Carya index for Ce-144 significantly exceeds ($P < 0.01$) the values for the other species both in soil (Carya 6720 plus or minus 1900; Acer 620 plus or minus 90; Liriodendron 320 plus or minus 50) and insolution (Carya 4590 plus or minus 450; Acer 770 plus or minus 430; Liriodendron 720 plus or minus 350; Nyssa 650 plus or minus 190; Quercus 170 plus or minus 40) in spite of large variation about the means. An insufficient number of Nyssa and Quercus seedlings survived in soil to permit valid statistical analyses. Nyssa and Carya indices for Co-60 in solution both significantly surpass ($P<0.50$) the indices for the other species but do not significantly differ from each other (Nyssa 5110 plus or minus 950; Carya 4470 plus or minus 890; Acer 990 plus or minus 500; Quercus 780 plus or minus 300; Liriodendron 410 plus or minus 130). Comparison of the index between treatments - soil versus solution - shows no significant difference for any species for either isotope. (See also W74-05181) (Houser-ORNL)
W74-05196

TRANSPIRATION MEASUREMENT IN PINES USING TRITIATED WATER AS A TRACER,
Argonne National Lab., Ill.
J. R. Kline, C. F. Jordan, and R. C. Rose.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 190-198, (1971) 4 fig, 16 ref, 2 tab.

Descriptors: *Transpiration, *Evapotranspiration, Measurement, *Moisture uptake, Transfer, *Red pine trees, Tritium, Water, Tracers, Water vapor, Air, Soils, Temperature, Thermal properties, Soil-water-plant relationships.
Identifiers: *Tritiated water.

Tritiated water was used to measure transpiration by red pines (Pinus resinosa) in the field throughout a growing season. The method used is based on previously published theoretical analyses of tracer dynamics in steady-state flowing systems. Transpiration began in the spring only when the soil was completely thawed, even though air temperatures had previously been above freezing for considerable periods of time. Spring transpiration averaged 0.3 cm/day for the forest stand. A maximum value of 0.8 cm/day was found in mid-June at a time when available soil moisture was not rate limiting. In August as soil moisture became depleted, average transpiration rate fell to 0.4 cm/day. Total seasonal consumption of water by the forest from April 1 to October 31, 1970, was 91.4 cm. Rainfall input during the same period was 82.5 cm, indicating only a minor moisture deficit for this growing season. Actually, measured seasonal values agreed well with estimates obtained by solution of Penman's equation and from the evaporation equivalent of net radiation. (See also W74-05181) (Houser-ORNL)
W74-05197

TRITIUM MOVEMENT IN AN OLD-FIELD ECOSYSTEM DETERMINED EXPERIMENTALLY,
Argonne National Lab., Ill.
C. F. Jordan, J. R. Kline, and D. S. Sasscer.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 199-203, (1971) 7 fig, 7 ref.

Descriptors: *Tritium, Movement, *Ecosystems, *Ecological distribution, Vertical migration, *Path of pollutants, Absorption, Roots, Water pollution, Soil contamination, Vegetation, Rain water, Diffusion, Model studies, Hydrologic models, Computer models, Adsorption, Clays, Evapotranspiration.

Tritium movement through an old-field ecosystem was studied in order to better understand how water behaves while inside various ecosystem compartments, and also to validate a mathematical model of tritium movement in ecosystems. Tritiated water was applied to field plots, and was collected at various depths in the soil and from the vegetation at approximately weekly intervals. The experimental results confirmed the following computer predictions: A pulse of tritium will move downward through the soil as a function of the amount of rainwater entering the soil above the pulse. Simultaneous with downward movement, the peak will broaden and flatten due to diffusion. The pulse will become immobilized if the upper soil dries out to the extent that rainwater does not penetrate to the depth of the pulse peak. Concentrations of tritium in vegetation will be equal to concentrations in the soil water at the depth at which the plant is taking up water. Loss of tritium from the system will occur by evapotranspiration and deep drainage. The computer predictions departed from the experimental results because of two phenomena not included in the model: (1) direct transfer of tritium to lower levels of soil via root and worm holes; (2) absorption of tritiated hydroxyl groups onto clay particles. (See also W74-05181) (Houser-ORNL)
W74-05198

INFLUENCE OF WATER REGIME ON THE INDIRECT ABSORPTION OF RADIOCESIUM, RADIOSTRONTIUM, AND RADIOCOBALT BY LOWLAND RICE,
European Atomic Energy Community, Ispra (Italy). Biology Div.
C. Myttenaere, and U. Marckwordt.

In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 212-217, (1971) 1 fig, 6 tab, 17 ref.

Descriptors: *Soil contamination, *Rice, *Cereal crops, *Cesium, *Cobalt, *Strontium, Absorption, Roots, Lysimeters, Data collections, Irrigation, Water pollution, Flood irrigation, Behavior, Ecology, Cation exchange, Oxidation-reduction potential.

Rice soils retain a high percentage of radionuclides transported by irrigation water. The accumulated radioactivity can partly be released to the roots of lowland rice. In order to establish the influence of water regime on the indirect radiocontamination of rice, the availability in soils and the absorption of plants of Cs-134, Sr-85, and Co-60 were studied during three successive years (1967, 1968, 1969), using the same variety in flooded and nonflooded conditions. The experimental conditions of the rice culture in lysimeters were checked with data collected in an irrigated rice field. Radiostrontium and radiocesium absorption by plants was not greatly influenced by the different water regimes. Radiocobalt level of plants was considerably higher in flooded rice and thus reflected the increased availability of Co in flooded soils. Concentration factors varied with the radionuclide and the plant organ. The variations in specific activity of radioisotopes in the plant underline a different behavior of the radioactive and stable isotope in the soil. Under these experimental conditions, only cations, the solubility of which depends directly on the redox state of the soil, were more available and were taken up by the rice plants. (See also W74-05181) (Houser-ORNL)
W74-05199

CALCIUM CYCLING: DIFFUSION INTO A FOREST SOIL,
Oak Ridge National Lab., Tenn.
D. F. Grigal.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 218-224, (1971) 3 fig, 2 tab, 16 ref.

Descriptors: *Calcium, Cycles, *Cycling nutrients, *Forest soils, Hickory trees, Oak trees, Maple trees, Ecosystems, Soil contamination, Water pollution, *Radioactivity, Movement, Soil water, Soil water movement, Diffusion, Vertical migration, Vegetation, Absorption, Transfer, Lysimeters, Cation exchange.

Calcium-45 was introduced into red maple (Acer rubrum L.) trees in spring, and the leaves were harvested in autumn and laid on the floor of an oak-hickory forest. Movement of Ca-45 from the leaves into other components of the ecosystem, and particularly into the soil and soil-water systems, was monitored for two winters and the intervening summer by periodic sampling of soil, litter, and soil-water. After 72 weeks, approximately 50% of the Ca-45 had moved into the soil. Activity of the isotope decreased exponentially with depth and little had moved below 20 cm. Some of the isotope had also cycled through the surrounding vegetation and back to the soil surface. The Ca-45 did not move into the soil in solution but instead moved by surface or exchange diffusion along the soil particles. A grain-boundary diffusion model, which infers rapid diffusion along pores and slow diffusion into soil peds, was used to predict this movement. The Ca-45 initially introduced into the system is accounted for by that observed in the litter and that predicted by the model in the soil. The results imply that studies which emphasize soil solution, as with tension lysimeters, may not provide sufficient information with which to describe movement of naturally incorporated cations from leaf litter into soil. The results further indicate that after introduced fertilizer cations are initially fixed either chemically by the soil or biologically by the macro- and microflora, losses of such cations from the system are likely to be small. (See also W74-05181) (Houser-ORNL)
W74-05200

THE BIOLOGICAL PATHWAY OF ZINC (ZN-65) IN FRESHWATER FISH AND ITS ALTERATION BY HEAVY METALS,
European Atomic Energy Community, Ispra (Italy). Biology Div.
For primary bibliographic entry see Field 5C.
W74-05201

CYCLING OF ZINC-65 IN A SIMPLE FOOD WEB,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
For primary bibliographic entry see Field 5C.
W74-05202

THE FATE OF COBALT-60 IN A NATURAL FRESHWATER ECOSYSTEM,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
For primary bibliographic entry see Field 5C.
W74-05203

ECOLOGICAL FACTORS AFFECTING THE ACCUMULATION OF CESIUM-137 FALLOUT BY A NATURAL POPULATION OF LARGEMOUTH BASS, (MICROPTERUS SALMOIDES),
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W74-05204

RELATIONSHIPS BETWEEN PHOSPHORUS-32 ACCUMULATION IN ALGAE, BACTERIA, AND TUBIFICIDS,
Western Michigan Univ., Kalamazoo. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-05206

UPTAKE OF RADIOPHOSPHORUS BY ROOTED AQUATIC PLANTS,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W74-05207

STRONTIUM-90 AND CESIUM-137 IN WATER AND DEEP SEDIMENTS OF THE GREAT LAKES,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
For primary bibliographic entry see Field 5C.
W74-05208

UPTAKE OF MOLYBDENUM MARKED WITH MO-99, BY THE BIOTA OF FERN LAKE, WASHINGTON, IN A LABORATORY AND FIELD EXPERIMENT,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5C.
W74-05210

EFFECT OF ORGANIC INSECTICIDES UPON CARBON-14 UPTAKE BY FRESHWATER PHYTOPLANKTON,
Florida Technological Univ., Orlando. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W74-05211

SOME ECOLOGICAL CONSIDERATIONS IN LOCATING A NUCLEAR-POWERED ELECTRICAL GENERATING FACILITY ON THE NORTH ANNA RIVER, VIRGINIA,
Virginia Commonwealth Univ., Richmond.
For primary bibliographic entry see Field 5C.
W74-05212

NUTRIENTS FROM TILE DRAINAGE SYSTEMS, BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE, SAN JOAQUIN VALLEY, CALIFORNIA.
California State Dept. of Water Resources Fresno. San Joaquin District.
Copy available from GPO Sup Doc a EP1.16:13030 ELY5/71-3, $1.00; microfiche from NTIS as PB 216 552 $1.45. Water Pollution Control Research Series, May 1971. 90 p, 18 tab, 29 tab, 3(ref. EPA Project 13030 ELY 05/71-3.

Descriptors: *Farm wastes, Path of pollutants, Water pollution sources, *Tile drainage, Nutrients, *Nitrates, *Phosphates, Denitrification, Fertilization, Irrigation practices, *California.
Identifiers: *San Joaquin Valley(Calif., *Composited drainage, *Nutrient variability, In digenous nutrients, Residual nitrogen.

Tile drainage systems of the San Joaquin Valle were monitored for nutrients (nitrogen an phosphorus) to determine the algal growth poter tial (AGP) of the waste, and the degree of trea ment required for removal of AGP. The objective were to determine: (1) the average nutrient cor centrations in tile drainage, (2) the magnitudes c annual, areal and seasonal variability of nutrien and discharges, (3) if a possible correlation exis between nutrients and agricultural practices, an (4) if existing soil conditions influence nutrier concentrations and flows. Average discharges an nutrient concentrations were calculated for di ferent years, months and areas of intere (valleywide, major tiled areas, physiographic pos tions and soils). Average nutrient concentration in the composited drainage from the Valley we found to be 19.3 mg/l for nitrogen (NO3-N) an 0.09 mg/l for phosphorus (PO4-P); averag discharge was 1.4 ac-ft/ac/yr. Nutrient levels in t composited drainage did not change appreciab with time. Variability of nutrients was observe for different seasons; a twofold decrease nutrients was attributed to dilution by irrigatic and denitrification. N was three times more co centrated in drainage from one out of four maj tiled areas investigated. The high N levels were a tributed more to indigenous concentrations in ce tain alluvial fan soils and their parent materia than fertilization. Low N levels found in drainag from basin soils were believed caused by denitri cation. P was seven times higher in the drainag from the southernmost area than the other are investigated. These extraordinarily high leve (0.69 mg/l) were attributed to indigenous conce trations in certain soils made available by anaer bic soil conditions. High discharge in the norther most area (2.3 ac-ft/ac) was believed to be caus by rapid laternal hydraulic conductivity and su rounding irrigation influence. (EPA)
W74-05229

SUBSURFACE BIOLOGICAL ACTIVITY I RELATION TO GROUND WATER POLL TION,
Robert S. Kerr Environmental Research Lal Ada, Okla.
W. J. Dunlap, and J. F. McNabb.
Copy available from GPO Sup Doc EP1.23:660/2-73-014, $0.90; microfiche from NT as PB-227 990 $1.45. Environmental Protecti Agency Technology Series Report EPA-660/2-7 014, September 1973. 60 p, 6 tab, 103 ref. EPA Pr ject 21 AKQ-10.

Descriptors: *Groundwater, *Subsurface vestigations, *Microbiology, *Subsurface wate Habitats, Water pollution, Water pollution effec Path of pollutants, Zone of aeration, Zone of sa

ation, Biological communities, Biodegradation, Temperature, Hydrostatic pressure, Anaerobic bacteria
Identifiers: *Subsurface microbiology, *Subsurface environment, Microbial activity.

Biological activity occurring in subsurface regions below the soil zone may be of considerable importance in determining the fate and effect of pollutants in ground water, but this possibility has received little previous attention. A discussion is presented of subsurface biological activity in regard to ground-water pollution as reflected by available literature references. The subsurface environment is discussed in terms of factors likely to be of greatest significance in regard to the development of biological systems, and previous investigations of subsurface microbial activity are reviewed. Available information indicates the presence in the upper continental crust of the earth of numerous regions, particularly those of sedimentary origin, which are probably suitable habitats for many microbial species. Previous investigations of subsurface microbial activity clearly show the presence of diverse microbial populations in many subsurface regions below the soil zone. Hence, microbial activity appears both possible and probable in most subsurface regions of importance in regard to ground water. Further elucidation of the extent and nature of microbial activity in subsurface regions is needed in developing methods for predicting the impact of pollutants on ground-water quality. (EPA)
W74-05230

CONTENT AND COMPOSITION OF ORGANIC MATTER IN SOD PODZOLIC AND SOD SANDY SOILS OF DIFFERENT DEGREES OF WETTING, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W74-05237

REGIONAL ENVIRONMENTAL POLLUTION STUDY: INVENTORY AND ANALYSIS.
Tulsa City-County Health Dept., Okla.
Indian Nations Council of Governments, Tulsa, Oklahoma, June 1972. 59 p, 1 fig, 11 tab, 5 ref. EPA OK 0656 1012.

Descriptors: *Data storage and retrieval, Environmental control, *Computer programs, Pollution abatement, *Urban sociology, Data processing, Planning, Pollutants, Information retrieval, Air environment, Water pollution control, Soil environment, Solid wastes, Waste water(Pollution), Data collections, Urbanization.
Identifiers: *Environmental impact, *Tulsa(Oklahoma), Impact assessment.

The Indian Nations Council of Governments is developing a computerized file containing all pertinent information with respect to environmental protection by providing inventories of all emissions to the ambient atmosphere, all effluents to the Region's streams, all industrial wastewater sources, all potable water sources and treatment plants, and all solid waste collection systems and disposal sites. Summaries are presented of the inventories along with a preliminary analysis of the data. Included is the second phase of the Environmental Data File (Coding Manual) consisting of computer forms, coded structures, instructions for coding, and an example computer retrieval. Some of the data items included in the seven sub-files are: industrial air contaminant emissions, industrial wastewater sources and effluents; industrial solid waste quantities; major sewage treatment facility capacities, discharge volumes and pollutional loads; water treatment plant capacities; solid waste landfill capacities; and proposed development data items. The data are structured for ease of integration into existing files, as well as ease of updating. The file will provide information on pollution problems necessary for making assessments of their environmental impact on various systems. The data can be used for systems models which are being developed for various public improvements. This is a continuing study designed to provide the framework for a complete data system on environmental pollution. The data system will be used for environmental impact assessment, water and sewerage planning, solid waste management, and many other planning functions. (Poertner)
W74-05239

ORGANOMERCURIALS IN THE ENVIRONMENT,
Glasgow Univ. (Scotland). Dept. of Chemistry.
R. J. Cross.
Chemistry and Industry, No 15, p 719-721, Aug 4, 1973. 1 fig, 2 tab, 11 ref.

Descriptors: *Mercury, Pollutants, *Water pollution sources, *Toxicity, Water pollution control, Chemcontrol, Biocontrol, Adsorption, Bacteria, Sediments, Environmental control, Environmental effects, Industrial wastes, Pollution abatement, Aquatic microorganisms, Aquatic bacteria, Bacteria, Benthic flora, Water chemistry, Enzymes, Chemical reactions, Economic feasibility, Dredging, Clams, Aquatic animals, Benthic fauna.
Identifiers: *Mercury compounds, Methyl mercury, Dimethyl mercury, Lewis acids.

The oceans contain about 100 million tons of Hg, many times the total volume mined, used, and dispersed by man, without threatening global poisoning. The isolated cases of pollution-caused Hg poisoning on record, as in chemical laboratories, are caused by locally high concentrations. The main ecological problem is due to Hg in surface waters. Its most dangerous source is the effluent from Cl-alkali factories. Oxidation converts Hg metal into Hg(II) ion which is rapidly adsorbed on bottom sediments, but gradually converted to methyl- and/or dimethyl mercury compounds, mainly by the methylcobalamine coenzyme contained in benthic microorganisms. Of several proposed methods for removal of Hg or the coenzyme from waterways (such as dredging, application of Lewis acids, biological conversion by Pseudomonas bacteria, and cultivation of clams in polluted waters), none seems as practicable or economical as the preventive approach of avoiding the entrance of Hg into waters in the first place. (Brown-IPC)
W74-05248

SLOW RELEASING NITROGEN FERTILIZER FROM THE WASTE PRODUCT, LIGNIN SULPHONATES,
Forschungsanstalt fuer Landwirtschaft, Brunswick (West Germany). Institut fuer Biochemie des Bodens.
W. Flaig.
Chemistry and Industry, No 12, p 553-554, June 16, 1973. 2 fig, 3 ref.

Descriptors: *Fertilizers, *Lignins, *Sulfite liquors, *Pulp wastes, *Nitrogen compounds, Ultimate disposal, Solid wastes, Liquid wastes, *Byproducts, Ammonium compounds, Nitrates, Organic compounds, Solubility, Industrial wastes, Waste disposal, Pulp and paper industry, Soil amendments.
Identifiers: Spent sulfite liquors, 'N-Lignin'.

A soluble fertilizer called N-Lignin was prepared by concentrating spent sulfite pulping liquor to 20% solids content and then heating it at 125 C and 12 atm pressure for 1-2 hr with oxygen and ammonia, followed by evaporation and spray drying. The product contained ca. 5% ammonia-nitrogen, 1% amide-nitrogen, and 6% other organic nitrogen. The N-Lignin was not readily leached from soil, because ca. 45% of the N was bound to high-molecular-weight substances. Good results were obtained in potted plant tests with N-Lignin alone or in 1:1 mixtures with ammonium nitrate. (Buchanan-IPC)
W74-05249

A STARCH-FREE EFFLUENT PROGRAM FOR CORRUGATING PLANTS,
Canada Starch Co. Ltd., Montreal (Quebec).
J. M. L. Currie.
CPPA (Canadian Pulp and Paper Association) Technical Section Proceedings, 1972. p D22-D24.

Descriptors: *Carbohydrates, *Industrial wastes, *Pollution abatement, Water pollution sources, *Pulp wastes, *Adhesives, Equipment, Operation and maintenance, Waste water(Pollution), *Canada, Effluents, Biochemical oxygen demand, Discharge(Water).
Identifiers: Starch, Gluing, Converting industry, Corrugated boards, Corrugated containers, Materials handling, Wash waters.

Starch can reach the sewers of a corrugated board or box factory as a result of faulty equipment, improper operation, and carelessness. The points at which starch is being lost in an adhesive gluing system have been studied at Canada Starch Co. Ltd. and included dry spills, system leaks, overflows, cleanups, and the use of nonstandard-quality batches of corrugating adhesives. Corrective measures by way of equipment modifications and improved handling and operating techniques are discussed. Specific remedies must be adapted to the specific conditions of each factory. No general panacea is possible. (Brown-IPC)
W74-05250

METHANOL DISTRIBUTION IN AN EVAPORATION PLANT,
Billeruds A.B., Saffle (Sweden).
For primary bibliographic entry see Field 5D.
W74-05253

WATER AND WASTE WATER PROBLEMS IN MODERN TEXTILE FINISHING PLANTS (WASSER- UND ABWASSERPROBLEME IM MODERNEN TEXTILVEREDLUNGSBETRIEB),
For primary bibliographic entry see Field 5D.
W74-05255

CHARACTERIZATION OF SULFITE PULPING EFFLUENTS AND AVAILABLE ALTERNATIVE TREATMENT METHODS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W74-05278

FOREST PRODUCTS POLLUTION CONTROL -- ANNOTATED BIBLIOGRAPHY (EXCLUDING PULP AND PAPER),
Western Forest Products Lab., Vancouver (British Columbia).
M. E. Johnson.
Available from the National Technical Information Service as PB-222 173, $3.00 in paper copy, $1.45 in microfiche. Supplementary Report No 1 to VP-X-100, June 1973. 10 p. 1 tab, 67 ref.

Descriptors: *Lumbering, *Wood wastes, *Industrial wastes, *Environmental control, *Water pollution sources, *Air pollution, *Bibliographies, Forest management, Forest fires, Waste water treatment, Treatment facilities, Canada, Waste disposal, Solid wastes, Equipment, Environmental effects, Pollution abatement, Waste water treatment, Saw mills.
Identifiers: Noise, Scenic pollution, Plywood industry, Wood industry, Forest products industry, Wood preservatives, Logging machines.

This supplement to an earlier annotated bibliography provides references (with abstracts) to the literature acquisitioned at the library of the Western Forest Products Laboratory between July 1972 and June 1973, dealing with water, air, noise, and/or scenic pollution of the environment caused by logging, log handling, and the manufacture of lumber, plywood, and other forest products other

than pulp and paper. (See also W73-03746) (Brown-IPC)
W74-05284

AGRICULTURAL POLLUTION CONTROL AND ENFORCEMENT IN NEW YORK STATE,
Cornell Univ., Ithaca, N.Y.
T. Flaim.
Available from the National Technical Information Service as PB-224 063, $3.00 in paper copy, $1.45 in microfiche. Paper prepared for the Assembly Scientific Staff of the New York Legislature. Nov. 17, 1972. 26 p. 3 tab, 28 ref.

Descriptors: *Pollution abatement, *New York, Agriculture, *Industrial wastes, Food processing industry, *Farm wastes, Dairy industry, *Pesticides, Air pollution, Water pollution sources, Sedimentation, Nutrients, Legislation, *Law enforcement, Research priorities.

A survey of the location, magnitude, and control of agricultural pollution problems in New York State led to the following findings: (1) Agriculture generates over 50% of the total waste volume produced annually in the USA, yet its contribution to pollution is relatively minor. (2) In decreasing order of importance, agricultural pollution sources in New York State come from food processing, animal (farm) wastes, dairy feedlots, sedimentation, plant nutrients, pesticides, and agricultural air pollution. (3) Compared to other industries, agricultural activity is diverse; hence agricultural pollution is difficult to measure, and any legislative control difficult to enforce. (4) Existing technology is adequate for controlling agricultural pollution, except food-processing wastes. Needs for further research are pointed out, and implications of this study for policy-making legislators are indicated. (Brown-IPC)
W74-05285

THE ROLE OF PAPER MILL ADDITIVES AS POTENTIAL STREAM POLLUTANTS -- DEVELOPMENT OF NUCLEAR TECHNIQUES,
Washington State Univ., Pullman. Coll. of Engineering Research Div.
For primary bibliographic entry see Field 5A.
W74-05287

PYROGRAPHIC ANALYSIS OF WASTE WATERS,
Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
For primary bibliographic entry see Field 5A.
W74-05294

ATRAZINE, PROPACHLOR, AND DIAZINON RESIDUES ON SMALL AGRICULTURAL WATERSHEDS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
W. F. Ritter, H. P. Johnson, W. G. Lovely, and M. Molnau.
Environmental Science and Technology, Vol 8, No 1, p 38-42, January 1974. 8 tab, 11 ref.

Descriptors: *Pesticide residues, *Agricultural watersheds, *Pesticide kinetics, *Triazine pesticides, *Phosphothioate pesticides, *Chlorinated hydrocarbon pesticides, Small watersheds, Degradation(Decomposition), Surface runoff, Movement, Water pollution sources, Persistence, Soil analysis, Bottom sediments, Watersheds(Basins), Water analysis, Diazinon, Loess, Soil profiles, Insecticides, Herbicides.
Identifiers: Fate of pollutants, Pesticide loss, Chemical concentration, Atrazine, Propachlor, Electron capture gas chromatography, Sample preparation.

Atrazine (2-chloro-4-ethylamino-6-isopropylamino-s-triazine), propachlor (2-chloro-N-isopropylacetanilide), and diazinon (0,0-diethyl 0-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate) losses in sediment and surface runoff were measured from four watersheds ranging in size from 1.9-3.8 acres and located in the loessial soil region of western Iowa. Two of the watersheds were planted to ridged corn, and two were planted to surface-contoured corn. Movement of atrazine, propachlor, and diazinon in the soil profile and degradation of these pesticides were measured. Water and sediment samples were obtained from the four watersheds with single-stage sediment samplers. All water and sediment samples were collected in glass bottles, transferred to polyethylene bottles, and frozen immediately after collection. Soil samples were taken within 24 h after pesticide application and at 7-day intervals for the first few weeks. The Geigy Chemical Corp. (1965) ultraviolet method was used for atrazine analysis. Propachlor and diazinon were determined by electron capture gas chromatography. Pesticide losses were much greater from the surface-contoured watersheds than the ridged watershed. Significant amounts of surface-applied atrazine and propachlor were removed from the surface-contoured watersheds by storms occurring shortly after the pesticides were applied. Insignificant amounts of diazinon were removed in the surface runoff and sediment. Generally, pesticide concentrations were higher in the sediment than in the runoff water; however, greater total losses were associated with the greater volume of water. (Holoman-Battelle)
W74-05295

MODEL FOR COLIFORM BACTERIA IN GRAND TRAVERSE BAY,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
R. P. Canale.
Journal Water Pollution Control Federation, Vol 45, No 11, p 2358-2371, November 1973. 16 fig, 8 ref.

Descriptors: *Coliforms, *Mathematical models, *Michigan, *Distribution patterns, Water temperature, Industrial wastes, Sewage, Flow, Water quality, Bays, Water pollution effects, Waste disposal, Equations, Dispersion, Seasonal, Mortality, Boats.
Identifiers: *Grand Traverse Bay(Mich), Boardman River, Survival.

A predictive model for total coliform bacteria in Grand Traverse Bay, Michigan, has been developed using continuity equations with a simple fluid transport model and temperature-dependent first order kinetics. The model has been verified over a wide range of loadings during a period of several years with data obtained during numerous field surveys. The model has been applied to a number of water quality control problems of interest to local planners and others, such as defining the role of storm sewer discharges to the bay, the effects of additional areas for development, and the discharge of wastes from private watercraft. (Mortland-Battelle)
W74-05328

ENERGY AND THE ENVIRONMENT--ELECTRIC POWER.
Council on Environmental Quality, Washington, D.C.
Available from NTIS, Springfield, Va. 22151 - PB-223 326 - Price $3.00 printed copy; $1.45 microfiche. Report, August 1973. 58 p, 13 fig, 18 tab, 1 append.

Descriptors: *Water pollution sources, *Electric powerplants, *Air pollution, *Environment, *Thermal powerplants, Costs, Electric power production.

The use of energy damages the environment not only when it is used but also when it is extracted, processed, transported, and distributed to the consumer. The production and use of energy pollute air, befoul streams, and damage land. And as th use of energy has multiplied, so have the attendar environmental impacts. The conflict betwee energy needs and the environment poses problem that must be solved by understanding th factors that influence demands for energy and b developing energy systems that meet these d mands with minimal damage to the environmen The elements underlying the growing demand f energy and the environmental implications of th complex energy systems for meeting this deman are examined. Focus is on electric energy becaus of the particularly rapid growth in this sector. In proved efficiency of energy systems and energ conservation will reduce environmental damag and slow use of energy resources. Electric energ demand forecasts can be combined with data c the environmental impacts of each electric energ system to yield an estimate of projected enviro mental consequences. (Knapp-USGS)
W74-05330

RESEARCH TO DETERMINE THE ENVIRO MENTAL RESPONSE TO THE DEPOSITION O SPOIL ON SALT MARSHES USING DIKE AND UNDIKED TECHNIQUES--FIRST ANNUA PROGRESS REPORT,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W74-05332

RELIABILITY AND ECONOMIC OPTIMIZ/ TION FOR URBAN RETURN FLOW MANAGEMENT,
Texas Univ., San Antonio. Div. of Environment Studies.
C. S. Shih, J. K. Garner, and G. L. Curry.
Water Resources Bulletin, Vol 10, No 1, p 10 118, February 1974. 8 fig, 5 tab.

Descriptors: *Optimization, *Water pollution co trol, *Urban runoff, Systems analys Economics, Probability, *Texas, Water manag ment(Applied).
Identifiers: *San Antonio(Tex.).

Reduction of pollution to urban water resourc by runoff was studied as a water-quality manag ment problem. An optimization model w developed for determination of the best pollutic control policies for each treatment facility in tern of the minimization of total regional cost requir ments, the quality control requirements, and t reliability desired. A change-constrained quadrat programming technique coupled with parametr analysis is utilized as the basic solution approac A practical problem based on the situation existi in the San Antonio River basin region of Tex was used for the illustration of this applicatio (Knapp-USGS)
W74-05333

NUMERICAL AND ANALYTICAL SOLUTION OF DISPERSION IN A FINITE, ADSORBIN POROUS MEDIUM,
California Univ., Davis. Dept. of Water Scien and Engineering.
M. A. Marino.
Water Resources Bulletin, Vol 10, No 1, p 81-9 February 1974. 1 fig, 6 ref.

Descriptors: *Dispersion, *Path of pollutant *Porous media, *Numerical analysis, Mathema cal models, Groundwater movement, Adsorption

Numerical and analytical solutions are develope for the distribution of a contaminant within an a sorbing porous medium in a unidirectional flo field subject to a step function for input concentr tion. The medium is considered to be homogen ous, isotropic, and areally finite. As a byproduc solutions are also obtained for the case of a nona sorbing porous medium. An example that demo strates the applicability of the solutions presented. (Knapp-USGS)
W74-05334

EFFECT OF TWO IMPOUNDMENTS ON THE SALINITY AND QUANTITY OF STORED WATERS,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
H. B. Pionke, and O. D. Workman.
Water Resources Bulletin, Vol 10, No 1, p 66-80, February 1974. 6 fig, 2 tab, 7 ref.

Descriptors: *Salinity, *Evaporation, *Reservoirs, *Oklahoma, Water quality, Water pollution sources, Seepage, Saline water, Flood control, Water chemistry, Impoundments.

The effect of hydrologic and chemical processes on salinization of stored waters was determined for two small floodwater-retarding structures located in western Oklahoma. One structure, designed to accommodate a large influx of sediment, was overdesigned (operated at reduced capacity) by upstream diversion of approximately one-half the inflow. Over a 2-year period, the total salinity of stored waters increased approximately 22 times, and the stored water volume decreased to 1/33 its initial volume in the overdesigned (underused) structure, while both volume and salinity of stored waters remained comparatively stable in the other structure. The lack of sufficient dilution by better quality surface runoff and the increased residence time of water in the impoundment apparently caused most of the salinity increase. The bulk of the salt load entering the overdesigned structure, to be concentrated later by evaporation, was associated with base rather than storm inflow. After base inflow ceased, substantial losses of salt load and stored water occurred concurrently. The loss was not adequately explained by chemical precipitation in association with evaporation. Seepage and evaporation appeared to account for much of the hydrologically unexplained loss of stored waters. (Knapp-USGS)
W74-05335

RETENTION BASIN FAILURES IN CARBONATE TERRANES,
Geological Survey of Albama, University. Limestone Hydrology Section.
W. M. Warren.
Water Resources Bulletin, Vol 10, No 1, p 22-31, February 1974. 4 fig, 12 ref.

Descriptors: *Subsidence, *Lagoons, *Water pollution sources, *Sinks, Karst hydrology, Limestones, *Carbonate rocks, Land subsidence, Subsurface drainage, Path of pollutants,
Identifiers: Subsurface erosion, Retention basins.

Sinkholes and subsidence occur in areas subject to dewatering of carbonate formations. Excessive groundwater pumpage is a causative factor in areas of increased sinkhole activity. Subsurface erosion of unconsolidated materials underlain by carbonate rocks is one cause of the collapses. Infiltrating water from retention basins may cause subsurface erosion and eventual failure by collapse of the structure. The resulting groundwater contamination would be great as the pollutants spread throughout the solution-cavity system. (Knapp-USGS)
W74-05337

THE NONPARASITIC DISEASES. IMMISSION DAMAGE (GAS, SMOKE AND DUST DAMAGE). WASTE WATER DAMAGE INCLUDING DAMAGE CAUSED BY SOLID WASTES,.
For primary bibliographic entry see Field 5C.
W74-05342

EFFECT OF GREEN FERTILIZER ON GRAPE YIELD,
Yu. Magriso, B. Danailov, G. Peshakov, and A. Georgiev.
Agrokhimiya. 4, p 56-60. 1972. Illus.
Identifiers: *Fertilizers, *Grapes, Manure, Microorganisms, *Nitrogen, Nutrition, Pea, Rye, Crop yield.

Experiments performed on black-soil, plowed-under with a pea-rye-green manure mixture, increased the amount of assimilated N and the number of beneficial microorganisms. These factors, with an optimal water regime, increased the harvest of grapes without loss of quality.--Copyright 1973, Biological Abstracts, Inc.
W74-05346

DRUG RESISTANCE OF COLIFORM BACTERIA IN HOSPITAL AND CITY SEWAGE,
National Inst. for Water Research, Pretoria (South Africa).
W. O. K. Grabow, and O. W. Prozesky.
Antimicrob Agents Chemother, Vol 3, No 2, p 175-180, 1973.
Identifiers: Ampicillin, Bacteria, Chloramphenicol, *Coliform bacteria, *Drug resistance, *Environmental, Escherichia-coli, Infect-drugs, Pollution, *Salmonella-typhi, *Sewage, Streptomycin, Sulfonamide, Tetracycline.

The number and properties of drug-resistant coliform bacteria in hospital and city sewage were compared. There was little difference in the counts of organisms with nontransferable resistance to 1 or more of 13 commonly used drugs. An average of 26% of coliforms in hospital waste water had transferable resistance to at least one of the drugs ampicillin, chloramphenicol, streptomycin, sulfonamide or tetracycline as compared to an average of 4% in city sewage. R+ bacteria in the hospital discharge were also resistant to a broader spectrum of drugs than those in city sewage. In both effluents, the occurrence of fecal Escherichia coli among R+ coliforms was twice as high as among coliforms with nontransferable resistance. Resistance was transferable to Salmonella typhi, and such drug-resistance pathogens in the water environment could be of particular concern. The significance of the results with regard to environmental pollution with R+ bacteria and the dissemination of these organisms is discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-05361

DIRECT COUNTS AND PLATE COUNTS OF BACTERIA IN THE DANUBE BETWEEN BERG SPRING AND ULM (IN GERMAN),
Staatl Institut fuer Seenforschung und Seenbewirtschaftung, Langenargen (West Germany).
For primary bibliographic entry see Field 5A.
W74-05362

PHYSIOECOLOGY OF THE UMSINDUSI RIVER WITHIN THE PIETERMARITZBURG CITY LIMITS,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Botany.
L. J. Nash, C. H. Bornman, and J. Heeg.
Trans R Soc S Afr, Vol 40, No 3, p 197-208, 1972, Illus.
Identifiers: *Bacteriology, Ecology, *Physioecology, Pollution, Rivers, *South Africa(Umsindusi River), Cities, *Domestic wastes.

A physioecological study of the Umsindusi River at Pietermaritzburg (South Africa) was carried out to estimate the changes in composition taking place during its passage through the city. While little evidence of gross industrial pollution was found, there was a marked enrichment of many constituents, particularly organic substances. A number of sources contribute to the pollution of the Umsindusi, and while this pollution is at present within the self-purification capacity of the river, recovery is slow, and the chemical and bacteriological quality of the water leaving Pietermaritzburg is poor.--Copyright 1973, Biological Abstracts, Inc.
W74-05363

MODELS FOR ENVIRONMENTAL POLLUTION CONTROL.
Michigan Univ., Ann Arbor. School of Public Health.
Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1973. 448 p, 39 fig, 12 tab, 200 equ, 228 ref. R. A. Deininger, Ed. Price: $24.50.

Descriptors: *Systems analysis, *Mathematical models, *Environmental control, *Water pollution control, *Water supply, *Pollution abatement, Solid wastes, Disposal, Air pollution, Optimization, Simulation analysis, Stochastic processes, Digital computers.

The use of mathematical models and systems analysis techniques is considered for the control of environmental pollution and resources development. These methods allow decision makers to screen the various control technologies and procedures and to select those which are most efficient. The book, written by an international group of experts, is organized in six major parts: (1) water pollution control; (2) water supply and water resources development; (3) air pollution control; (4) solid waste disposal; (5) noise control; and (6) total environmental models. Each of these sections contains one or more individual papers. Overall, the book summarizes the present state-of-the-art in mathematical modeling for environmental pollution control. Included are a description of a river basin model and numerous alternate strategies available for improving the river's water quality, a paper dealing with regional sewerage systems, a discussion of ecological aspects of water quality models, the design of water supply systems, a consideration of the economic consequences of constructing weirs and canals, results of air quality modeling studies of cities in Germany, experiences with vehicle routing models in the United Kingdom, the introduction of mathematical modeling and formal optimization techniques to noise pollution, an overall environmental quality model, and an analogy between the safeguard of nuclear materials and environmental pollution control. (Bell-Cornell)
W74-05386

SYSTEMS ANALYSIS FOR ENVIRONMENTAL POLLUTION CONTROL,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5G.
W74-05387

MODELING OF WASTEWATER DISPOSAL SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5D.
W74-05388

REGIONAL WASTEWATER MANAGEMENT SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 5D.
W74-05389

A REGIONAL PLANNING MODEL FOR WATER QUALITY CONTROL,
Purdue Univ., Lafayette, Ind., Dept. of Economics.
D. E. Pingry, and A. B. Whinston.
In: Models for Environmental Pollution Control, (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 61-90 (Chapter 3), 1973. 2 fig, 4 tab, 1 map, 71 equ, 20 ref, 3 append.

Descriptors: *Water quality control, *Water temperature, *Dissolved oxygen, *Indiana, *Water

pollution treatment, *Costs, *Simulation analysis, Information retrieval, Optimization, Resource allocation, Comprehensive planning, River basins, Regional analysis, Effluents, Economic efficiency, Alternative water use, Biochemical oxygen demand, Thermal pollution, Waste water(Pollution), Cooling towers, Flow augmentation, Constraints, Computer programs.
Identifiers: *West Fork White River(Ind.), *External effects, Regional planning, Opportunity costs, By-pass piping, Treatment plants, Nonlinear programming.

The information problem when dealing with external effects of water pollution is immense. Usually the external effect (cost or benefit) is transferred to the affected party through a complex series of physical, chemical or biological processes; an initial effluent discharged by a polluter may affect a downstream user, and in such a case the opportunity costs of a specific resource allocation are not at all clear. This has led to attempts to produce the effects of resource allocation under external effects by modeling the appropriate physical system. Moreover, since different policies are appropriate for different polluters--uniform rules cause significant inefficiencies--a regional approach (thus various treatment strategies) is being considered. Presented is a simulation model of river basin water quality that serves as the constraint set for an optimization model which searches for the efficient solutions given the quality goals. The model explicitly considers water temperature and its relationship to dissolved oxygen; it considers simultaneously several treatment strategies and their costs. The model answers: What is the least cost combination of treatment facilities that will meet given temperature and dissolved oxygen goals. Using such a model, a river basin authority could present an assortment of river use and cost combinations for consideration by the affected parties. (Bell-Cornell)
W74-05390

INTRODUCTION TO SIMULATION TECHNIQUES,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W74-05391

MATHEMATICAL MODEL FOR OXYGEN BALANCE IN RIVERS,
Societe Grenobloise d'Etude et d'Applications Hydrauliques (France).
G. Chevereau.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 107-136 (Chapter 5), 1973. 14 fig, 28 equ, 11 ref.

Descriptors: *Simulation analysis, *Water quality control, *Oxygen, Rivers, Biodegradation, Diffusion, *Computer programs, Advection, Unsteady flow, Downstream, Reach(Streams), Organic matter, Systems analysis, Mathematical models.
Identifiers: *France(River Vienne), *Streeter-Phelps equation, Finite differences, Paper mills.

A mathematical model is described, based on the Streeter-Phelps equation which has been extended to allow for diffusion. A computer program has been established which simulates unsteady flow in rivers. The parameters of the unsteady flow are introduced into the pollution model in which the Streeter-Phelps equation is approximated in a finite difference form and integrated by the so-called 'two steps explicit method.' Discussed is the testing of the model on the French river Vienne in a reach downstream of a large paper mill, in connection with a specialist team of chemists and biologists. Observance showed a significant discrepancy between the rates of biodegradation of organic matter measured in laboratory tests and those obtained by adjustment of the model. Auxiliary phenomena make the problem more complex so that rational determination of the rate of biodegradation of organic matter is hazardous. Thus, presently, it seems best to evaluate 'bulk rates' of biodegradation by adjustment of a model on observed situations in the river. This method necessitates numerous field measurements and requires great care in extrapolating the results of the model. (Bell-Cornell)
W74-05392

WATER QUALITY MODELS AND AQUATIC ECOSYSTEMS STATUS, PROBLEMS AND PERSPECTIVES,
Virginia Inst. of Marine Science, Gloucester Point.
M. E. Bender.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 137-153 (Chapter 6), 1973. 7 fig, 34 ref.

Descriptors: *Water pollution control, *Aquatic environment, *Mathematical models, *Eutrophication, *Biota, *Water quality, Ecosystems, Systems analysis.

Most biological models are too restricted in scope to be directly useful in evaluating pollutant-related stresses in aquatic environments. They are limited since they usually describe only one problem area (trophic level) within the system, and they often must be ramified, at considerable expense, before being applied to other similar environments. However, in specific types of aquatic environments, those stresses considered natural in nature, i.e., those created by oxygen-consuming wastes, are understood sufficiently to allow for the construction of total ecosystem models. Such models can account for the major functional changes such as respiration and nutrient regeneration as being functions of variables such as time and concentration. Although important, however, nonfunctional changes are less easily modeled; also, at the present time we lack sufficient knowledge to build models describing the effects of pollutants of unnatural origin. Bender considers biotic indices and eutrophication in detail to illustrate the current status of practical water quality models that deal with biotic responses. Although the examples presented can at best be considered as subsystem models, they are representative of the types of models being used to solve water pollution problems. (Bell-Cornell)
W74-05393

MODELS OF WATER SUPPLY SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 4A.
W74-05394

AN ECONOMIC APPRAISAL OF CHANGES IN WATER USE THROUGH INVESTMENTS IN NAVIGABLE RIVERS AND CANALS,
Kocks (F. H.), Duesseldorf (West Germany).
For primary bibliographic entry see Field 6A.
W74-05395

WATER RESOURCES MANAGEMENT,
Ecole Nationale Superieure des Mines de Paris (France).
For primary bibliographic entry see Field 6B.
W74-05396

MATHEMATICAL APPROACH TO WATER RESOURCES MANAGEMENT IN ITALY,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
For primary bibliographic entry see Field 6A.
W74-05397

TOTAL ENVIRONMENTAL QUALITY MANAGEMENT MODELS,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05398

ACETYLENE-REDUCTION ASSAY OF ANAEROBIC NITROGEN FIXATION BY SEDIMENTS OF SELECTED WISCONSIN LAKES,
Wisconsin Univ., Madison. Dept. of Soil Science.
A. N. Macgregor, and D. R. Keeney.
Journal of Environmental Quality, Vol 2, No 4, p 438-440, October-December 1973. 4 tab, 18 ref.

Descriptors: *Hardness(Water), *Nitrogen fixation, *Lake sediments, *Assay, Lakes, *Wisconsin, Sampling, Cycling nutrients, Anaerobic conditions.
Identifiers: *Acetylene reduction, Sample preparation, Lake Wingra, Lake Mendota, Tomahawk Lake, Trout Lake, Crystal Lake, Plum Lake, Lake Minocqua, Little John Lake.

Sediment samples were collected by Ekman dredge from 2 hardwater and six softwater lakes in Wisconsin for use in acetylene reduction tests to obtain a first approximation of the amounts of combined N added to lake sediments by anaerobic N fixation. To conduct the assay, sediment was transferred by syringe to 160-ml serum bottles containing 4-mm glass beads. The bottles were sealed with neoprene septa held firmly in place with aluminum seals. With the aid of hypodermic needles, each bottle was simultaneously flushed with a continuous flow of pure He and shaken so as to completely mix the beads and sediment. Ethylene, acetylene, and methane in the atmosphere above the sediment were determined after 1 and 2 days of incubation by gas chromatography. Rate of acetylene reduction indicated that, on the average, sediments from hardwater and softwater lakes may fix 37 and 7.7 ng of N, respectively, per gram (dry weight) per day. The rate of acetylene reduction diminished in the presence of nitrogenase inhibitors. (Little-Battelle)
W74-05400

5C. Effects Of Pollution

AN ANALYSIS OF MERCURIALS IN THE ELEPHANT BUTTE ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-04859

THERMAL EFFECTS ON BIOLOGICAL PRODUCTION IN A POND,
Wisconsin Univ., Madison. Dept. of Zoology.
H. F. Siewert.
Available from the National Technical Information Service as PB-228 659 $12.50 in paper copy, $1.45 in microfiche. Ph.D. Thesis, 1973. 172 p, 37 fig, 11 tab, 145 ref. (Issued by University of Wisconsin Water Resources Center, Madison). OWRR A-020-WIS(2). OWRR A-032-WIS(2). 14-01-0001-1870. 14-31-0001-3050.

Descriptors: Water chemistry, *Plant growth, *Chara, *Fishkill, *Nutrients, *Sunfishes, Oxygen, Alkalinity, Conductivity, Hydrogen, Sulfide, Stratification, Temperature, *Wisconsin, *Thermal pollution, Water pollution effects.
Identifiers: Thermal addition, *Fish growth, Food supply.

Physical, chemical, and biological differences between two similar ponds were studied. One pond was heated to 5C above ambient temperature, while the other served as a reference. Two hundred and fifty green sunfish, Lepomis cyanellus, were planted in each pond. The young-of-the-year grew at a higher rate in the heated pond and permitted Chara to grow year round at an accelerated rate. The heated pond produced more oxygen during the day and lost more oxygen during the night than did the reference pond. The

latter showed greater annual fluctuations of total alkalinity and conductivity. Concentration of hydrogen sulfide in the lower half of the water column, caused by stratification within the reference pond, killed fish in both the summer and winter periods. There was an indication that the synergistic effect of temperature and oxygen with an unlimited food supply will promote fish growth. W74-04861

OCEAN DUMPING IN THE NEW YORK BIGHT: AN ASSESSMENT OF ENVIRONMENTAL STUDIES,
Coastal Engineering Research Center, Fort Belvoir, Va.
G. Pararas-Carayannis.
Available from NTIS, Springfield, Va 22151 AD-766 721 Price $3.00 printed copy; $1.45 microfiche. Technical Memorandum No 39, May 1973. 159 p, 50 fig, 21 tab, 117 ref.

Descriptors: *Water pollution sources, *Water pollution effects, New York, *Municipal wastes, *Continental shelf, Oceans, Environmental effects, Water pollution, *Waste disposal.
Identifiers: *New York Bight.

Short-term studies on effects of ocean dumping in the New York Bight include hydrographic, geological, chemical, biological investigations, and a feasibility study for a remote-controlled electronic sensing system to detect the location and dump status of waste disposal vessels. Circulation patterns were estimated by current meters and by seabed and surface drifters. Chemical analyses were made of the concentration of phosphorus, nitrate, total iron, dissolved oxygen, and chlorophyll-a. Temperature, salinity, turbidity, and pH were measured. Sediment samples were analyzed for organic content and the heavy metals, and biological samples for heavy metals and mercury. Included are studies of benthic meiofauna and macrofauna, zooplankton, finfish and bacteria and disposal of sewage sludge, dredge spoils and acid-iron wastes. Waste disposal results in an increase in the nutrient concentration of the waters of the dumping grounds, and the biochemical oxygen demand of the wastes during summer reduces the dissolved oxygen concentration of bottom waters. The studies defined areas with high carbonaceous content in the sediments, and correlated such carbon-rich deposits with sewage and dredge spoils dumped in the area, and with anomalously high concentration of heavy metals such as silver, chromium, cadmium, copper, lead, nickel, and zinc. The large volume of wastes being dumped in the Bight and frequency of dumping has changed the marine environment of the dumping grounds and adjacent areas. (Knapp-USGS)
W74-04863

ULTIMATE UPPER LETHAL TEMPERATURE OF ATLANTIC SALMON SALMO SALAR L.,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
E. T. Garside.
Canadian Journal of Zoology, Vol 51, No 8, p 898-900, August 1973. 1 tab, 8 ref.

Descriptors: *Atlantic salmon, *Lethal limit, *Water temperature, *Bioassay, *Thermal stress, Statistical methods, Freshwater, Mortality, *Canada, Water pollution effects.
Identifiers: *Parr, Acclimatization, Probit analysis, Salmo salar, Data interpretation.

Thermal bioassays were conducted on parr of Atlantic salmon ranging from 70 to 147 mm total length (2.1-29.4 g) collected from a segment of 400 m immediately above high-tide elevation in Bio Brook, Terra Nova National Park, Newfoundland, during early July, 1969. Temperature of the brook varied from 16 to 20C during the 3-day collecting period. Parr were maintained and acclimated in 75-liter glass aquaria containing water drawn from Big Brook. Acclimation was accomplished through the elevation of water temperature 0.5 degrees every 10 h from the temperature of collection with sensitive heater-thermostats until the desired level (27.5C) was achieved. Upper lethal temperature for the highest level of acclimation (27.5C) was calculated from percentage mortality, as a function of test temperature, using probit analysis in the biomedical program (BMDO35) adapted for CDC 6400 computer. The upper lethal temperature for acclimation 27.5C was determined to be 27.80C plus or minus 0.41 for 10,000 min exposure. There was no significant correlation (P much greater than 0.05) between size and order of death. (Holoman-Battelle)
W74-04869

SURVIVAL OF BROOK TROUT IN A BOG-DERIVED ACIDITY GRADIENT,
Pennsylvania State Univ., University Park. Dept. of Biology.
W. A. Dunson, and R. R. Martin.
Ecology, Vol 54, No 6, p 1370-1376, Autumn 1973. 8 fig, 1 tab, 8 ref.

Descriptors: *Brook trout, *Resistance, *Hydrogen ion concentration, *Bioassay, On-site tests, Acid streams, Water analysis, Bogs, Acidity, Electro-fishing, Acidic water, Fishing, Freshwater fish, Water sampling, Chemical analysis, Rainfall, *Pennsylvania.
Identifiers: Survival, *Acidity gradient, *Bear Meadows Bog(Penn), White sucker, Sinking Creek, Carbonic acid, Salvelinus fontinalis, Semotilus atromaculatus, Rhinichthys atratulus, Blacknose dace, Creek chub, Catostomus commersoni, Median tolerance limit.

Bear Meadows Bog water was analyzed to determine (1) if volatile acids were present, (2) the species of fish present at various pH's in the stream, and (3) the pH tolerance of hatchery brook trout placed in the stream at points where native fish were present or absent. The acidity of the bog water (pH 3.7-4.7) is not due to carbonic acid or to any other volatile acid. The approximate pK of the unknown bog water acid(s) is 6.0-6.5. Fish do not occur in Bear Meadows Bog or in Sinking Creek (the bog's only outlet) over a 4.8-km section below the bog where water pH is too low for their survival. The lowest pH in which brook trout and white suckers were caught in Sinking Creek was 4.25 at area 5 (5.25 km below the bog) after a period of unusually heavy rainfall. At a different time brook trout alone were caught at area 4, 5.2 km below the bog, when the pH was 4.75. The lowest recorded pH at this site was 4.0. Survival times of hatchery brook trout placed in boxes in Sinking Creek were directly related to pH. Individual differences in tolerance to low pH were quite marked, especially at pH's not rapidly lethal. Whether these individual differences are of environmental or genetic origin is not known. (Holoman-Battelle)
W74-04873

RESPIRATION OF A SUBLITTORAL COMMUNITY,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5B.
W74-04874

THE EFFECTS OF HURRICANE CAMILLE ON THE MARSHES OF THE MISSISSIPPI RIVER DELTA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
For primary bibliographic entry see Field 2L.
W74-04875

PRIMARY PRODUCTION OF THE PERIPHYTON IN THE LITTORAL OF THE DANUBE,
Slovenska Akademie Vied, Bratislava (Czechoslovakia). Lab. of Fisheries and Hydrobiology.
M. Ertl, and J. Tomajka.
Hydrobiologia, Vol 42, No 4, p 429-444, September 28, 1973. 4 fig, 2 tab, 36 ref.

Descriptors: *Periphyton, *Primary productivity, Littoral, Rivers, *Biomass, Growth rates, Cultures, *Photosynthesis, Water levels, *Chlorophyll.
Identifiers: *Danube River, Chlorophyll a, Light and dark bottle method.

The gross primary production of periphyton, grown on artificial substrata in the littoral of the Danube, was measured by the light and dark bottle method from April, 1970 to March, 1971. The periphyton used for the measurements was sampled from various depths, in order to cover the production of the whole littoral. The highest primary production was always found in the zone just below the water level. Exceptions occurred only when this zone was inundated for a short time as a result of a temporary rise of the water level and the periphyton was insufficiently developed. In order to compare the values of primary production of periphyton obtained from shallower rivers, where the whole bottom is well illuminated, or from rivers that do not exhibit such frequent and extensive level oscillations as the Danube, average value calculated from results obtained from the zone closest to the water level at the time of measurements, were always used. Primary periphytic production in the surface zone was 43.8 mg 02/sq dm/day. Efficiency of gross photosynthesis in this zone was on the average 1.72 percent. The height of the water level and the water temperature were highly correlated with gross periphytic production. Close relationships between chlorophyll a content, biomass and gross primary production of periphyton were found. (Mortland-Battelle)
W74-04876

TIDAL STREAM DEVELOPMENT AND ITS EFFECT ON THE DISTRIBUTION OF THE AMERICAN OYSTER,
Delaware Univ., Lewes. Coll. of Marine Studies.
R. Keck, D. Maurer, and L. Watling.
Hydrobiologia, Vol 42, No 4, p 369-379, September 28, 1973. 8 fig, 1 tab, 21 ref.

Descriptors: *Oysters, *Tidal streams, *Distribution patterns, *Environmental effects, Meanders, Currents(Water), Scour, Deposition(Sediments), Dredging, Erosion.
Identifiers: American oyster, Crassostrea virginica, Current velocity, Delaware Bay, Macroinvertebrates.

This research was undertaken to determine the effect of tidal stream development on the distribution of the American oyster Crassostrea virginica. Data are presented on the effect of tidal stream formation on larval setting spat development, and maintenance of a healthy adult population. The four major oyster producing rivers in the state of Delaware are: the Leipsic, Murderkill, Mispillion, and Broadkill. In the majority of rivers the oyster producing sections extend 3500-4000 yards (3150-3600 m) from the river mouths. These sections were staked off in 100 yard (90 m) intervals. An oyster dredge with an approximate one meter mouth was towed over the right, middle, and left portions of each 100 yard (90 m) section. All live oysters (larger than 2 cm in height) were counted and measured to the nearest tenth of a centimeter. The total number of oysters per haul was used to plot the density of the oyster beds, and eventually to estimate the total number of bushels for each river. Dense populations are most often found associated with large meanders. The differential current velocities associated with meander formation result in areas of scour, which are beneficial to development of oyster beds; and areas of deposition, which are detrimental to survival of oysters. (Mortland-Battelle)
W74-04878

ULTRASTRUCTURE OF THE GREEN ALGA DICHOTOMOSIPHON TUBEROSUS WITH SPECIAL REFERENCE TO THE OCCURRENCE OF STRIATED TUBULES IN THE CHLOROPLAST,
Illinois Univ., Urbana. Dept. of Botany.
O. Moestrup, and L. R. Hoffman.
Journal of Phycology, Vol 9, No 4, p 430-437, December 1973. 10 fig, 19 ref.

Descriptors: *Aquatic algae, *Chlorophyta, *Cytological studies, Electron microscopy, Plant morphology, Aquatic plants.
Identifiers: *Dichotomosiphon tuberosus, *Ultrastructure, Chloroplasts, Vaucheria, Saprolegnia, Phycomycetes, Cytoplasmic streaming, Sample preparation.

The ultrastructure of the siphonous green alga Dichotomosiphon tuberosus (A. Br.) Ernst is compared with that of other siphonous plants. There is a characteristic association between the Golgi bodies and endoplasmic reticulum, but the mitochondria are not involved in the association as they are in Vaucheria and the phycomycete Saprolegnia. An unusual structure and arrangement of the chloroplasts is described as well as a previously unreported type of 'striated tubule' which occurs in most if not all chloroplasts and amyloplasts. The structure of these tubules is compared with that of other tubules recently found in green algae and higher plants. In addition, cytoplasmic microtubules arranged in the longitudinal direction of the siphon suggest a function in cytoplasmic streaming. (Holoman-Battelle)
W74-04881

THE PRODUCTION OF HYDROGEN PEROXIDE BY BLUE-GREEN ALGAE: A SURVEY,
Texas Univ., Austin. Dept. of Zoology.
S. E. Stevens, Jr., C. O. P. Patterson, and J. Myers.
Journal of Phycology, Vol 9, No 4, p 427-430, December 1973. 1 fig, 2 tab, 7 ref.

Descriptors: *Aquatic algae, *Cyanophyta, *Kinetics, Light, Nostoc, Cultures, Inorganic compounds.
Identifiers: *Hydrogen peroxide, *Axenic cultures, Photochemistry, Biosynthesis, Culture media, Algal physiology, Photoreduction, Photoproduction.

Thirty-eight axenic isolates of blue-green algae (Cyanophyta) were surveyed for hydrogen peroxide production. In order to avoid complications due to poor growth, three different culture media were used. Cells were grown in liquid culture on the chosen medium at 35C, with continuous agitation and 1 percent CO2 in air (v/v) bubbling through the culture. 5-25 w tungsten lamps were positioned 8 cm from the growth tubes in order to enhance peroxide production. Sixteen of the isolates (type I) showed no production of H202 within the sensitivity of the assay. Type II isolates showed no H202 production while in darkness, but at onset of illumination, H202 production was observed. After a short initial induction period, the rate of peroxide production remained steady until assay ingredients were exhausted or until light was extinguished. Type III isolates produced no H202 while in darkness, but at onset of illumination, displayed peroxide production with complex kinetics. Salient features included an initial lag, followed by a burst of period of rapid production of H202; the burst graded into a lower rate which then held steady. Type IV isolates differed markedly from all other assayed in that type IV algae produced H202 in darkness. Illumination of type IV cells caused an immediate increase in rate of H202 production. This increased rate continued without variation until light off. At light off, peroxide production dropped back to a rate equal to or sometimes slightly greater than the initial rate observed prior to illumination. The three kinetic profiles observed for peroxide formation are described. The possible site or sites of hydrogen peroxide formation remain unknown. (Holoman-Battelle)
W74-04882

SPECIES OF OCEANIC DINOFLAGELLATES IN THE GENERA DISSODINIUM AND PYROCYSTIS: INTERCLONAL AND INTERSPECIFIC COMPARISONS OF THE COLOR AND PHOTON YIELD OF BIOLUMINESCENCE,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W74-04883

CHLOROPHYLL, NITROGEN, AND PHOTSYNTHETIC PATTERNS DURING GROWTH AND SENESCENCE OF TWO BLUE-GREEN ALGAE,
Queen's Univ., Kingston (Ontario). Dept. of Biology.
R. J. Daley, and S. R. Brown.
Journal of Phycology, Vol 9, No 4, p 395-401, December 1973. 3 fig, 1 tab, 35 ref.

Descriptors: *Aging(Biological), *Chlorophyll, *Nitrogen, *Photosynthesis, *Plant growth, Plant pigments, *Cyanophyta, Aquatic algae, Instrumentation, Aquatic plants, Nitrates, Growth rates, Cultures, Electron microscopy, Light intensity, Nitrogen fixation.
Identifiers: Anacystis nidulans, Phormidium molle var. tenuior, Growth kinetics, Phycocyanin, Thylakoids, Senescence, Carotenoids, Ultrastructure, Culturing techniques, Organic nitrogen, Oxygen evolution.

A standardized, multiflask, batch culture system was developed to study the processes of algal senescence in Anacystis nidulans and Phormidium molle Gom. var. tenuior W. et G. West. Growth data over a 3-year period gave reproducible and comparable time-course curves. Although A. nidulans in unicellular and P. molle filamentous, the patterns of change with age were similar. Mean logarithmic doubling times and carbon yields were, respectively, 6.9 hr and 390 mg C/liter for A. nidulans and 7.2 hr and 710 mg C/liter for P. molle. Chlorophyll concentration and photosynthetic capacity per unit carbon rose rapidly during the logarithmic phase to maximum levels in either late log phase (P. molle) or early linear phase (A. nidulans), then fell throughout the declining growth phase to low levels in the stationary phase. Nitrate was rapidly exhausted from the medium during the period of logarithmic growth and stoichiometrically converted to particulate organic form; very little subsequent fixation of molecular nitrogen occurred. The phycocyanins were rapidly destoryed during the logarithmic phase while the carotenoids remained relatively constant throughout the whole growth period and then slowly declines. Preliminary electron micrographs showed a progressive deterioration in cellular ultrastructure, especially a reduction in the number of photosynthetic thylakoids, commencing in the linear growth phase. Analysis of the results suggests that occurrence of linear growth kinetics and termination of culture growth were caused by exhaustion of nitrate. The observed decreases in chlorophylls, phycocyanins, and photosynthetic capacity during active culture growth show that senescence effects may not be, as assumed, restricted to the stationary phase of growth. (Holoman-Battelle)
W74-04884

UREASE ACTIVITY OF ENTEROBACTERIACEAE: WHICH MEDIUM TO CHOOSE,
Ghent Rijksuniversiteit (Belgium). Lab. for Pharmaceutical Microbiology.
For primary bibliographic entry see Field 5A.
W74-04888

THE EFFECT OF THYROXINE AND TRIIODOTHYRONINE ON BACTERIAL GROWTH,
Bar-Ilan Univ., Ramat Gan (Israel). Dept. of Life Sciences.
For primary bibliographic entry see Field 5A.
W74-04891

EFFECT OF HELIUM GAS AT ELEVATED PRESSURE ON IRON TRANSPORT AND GROWTH OF ESCHERICHIA COLI,
Naval Medical Research Inst., Bethesda, Md.
N. A. Schlamm, J. E. Perry, and J. R. Wild.
Journal of Bacteriology, Vol 117, No 1, p 170-174, January 1974. 1 fig, 4 tab, 14 ref.

Descriptors: *E. coli, *Helium, *Environmental effects, *High pressure, *Iron, Growth rates, Hydrostatic pressure, *Bacteria.
Identifiers: 2 3-Dihydroxybenzoylserine, Culture media, 2 3-Dihydroxybenzoic acid, Ferric sulfate, EDTA.

Helium at an ambient pressure of 68 atm with 0.2 atm of O2 shortened by 1 to 1.5 h the lag phase for growth of Escherichia coli in minimal medium supplemented with 2 microliters of cell-free culture filtrate (CFF) per ml or with 1 microM 2,3-dihydroxybenzoylserine (DHBS), an iron chelator. The lag phase of cultures not exposed to helium could be shortened by use of supplements, but higher concentrations were required - 10 to 30 microliters of CFF per ml or 10 to 50 microM DHBS. Strain AN 193 of E. coli, which requires the DHBS precursor 2,3-dihydroxybenzoic acid (DHBA), grew well in media with 10 microM DHBA when exposed to helium at 68 atm, whereas 100 microM DHBA was required for growth in unexposed cultures. In the presence of 100 microM DHBA plus 1.0 microM ethylenediaminetetraacetic acid, growth was inhibited at 1 and 68 atm. Growth was restored, however, by the addition of 0.1 microM FeSO4 at 68 atm and 1.0 microM FeSO4 at 1 atm, but lag times were invariably shorter in the pressurized cultures. Hydrostatic pressures of 68 atm did not reduce the lag phase in the presence of CFF, DHBS, or DHBA. Results suggest that 68 atm of helium pressure, but not hydrostatic pressure, elicited a more rapid transport of iron into the cells. (Holoman-Battelle)
W74-04897

BIOLOGICAL RESPONSE TO DETERGENT AND NONDETERGENT PHOSPHORUS IN SEWAGE - PART I,
Utah Water Research Lab., Logan.
D. B. Porcella, P. A. Cowan, and E. J. Middlebrooks.
Water and Sewage Works, Vol 120, No 11, p 50-67, November 1973. 2 fig, 3 tab, 6 ref.

Descriptors: *Algae, *Detergents, *Growth rates, *Limiting factors, *Phosphorus, *Waste treatment, Bioassay, Chemical analysis, Domestic wastes, Nutrients, Water pollution effects, Nitrogen, Iron, Trace elements, Phosphates, Water pollution sources, Water treatment, Water pollution control.
Identifiers: Selenastrum capricornutum, Anabaena flos-aquae.

Sewage effluent from a suburban community of the City of Logan, Utah, was collected during times when detergents were and were not used to ascertain whether the elimination of phosphate detergents would affect algal growth. Algal bioassays were conducted with Selenastrum capricornutum and Anabaena flos-aquae using nutrient spikes to determine which nutrients were limiting. Bioassays were also performed using secondary treated, detergent-free sewage samples spiked with detergent to observe whether any increase in biostimulation resulted. The nutrient spikes were NH4Cl, KH2PO4, Fe and trace elements, and NAAM solution for control. Chemical analysis of the sewage samples showed that restricted use of detergent resulted in a 57 percent decrease in phosphorus content; alum treatment also reduced phosphorus content. However, calculated phosphorus concentrations in the bioassay flasks

for different dilutions of the secondary and tertiary effluents of the two sewage samples indicated the P content was high as a result of the high level of P in the reservoir water used for dilution. It is concluded that if the P content of the water is naturally high, the addition of more P will not affect algal growth. The results of the algal bioassays are not included. (Little-Battelle)
W74-04901

CHARACTERISTICS OF PHOSPHORUS DEFICIENCY IN ANABAENA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
F. P. Healey.
Journal of Phycology, Vol 9, No 4, p 383-394, December 1973. 10 fig, 3 tab, 74 ref.

Descriptors: *Anabaena, *Deficient elements, *Phosphorus, *Cytological studies, Plant physiology, *Assay, Cyanophyta, Plant growth, Bioindicators, Aquatic algae, Temperature, Hydrogen ion concentration, Light, Phosphates, Absorption, Carbohydrates, Bioassay, Nutrient requirements.
Identifiers: *Enzyme activity, Heterocysts, Alkaline phosphatase, Culture media, Substrate concentration, Chlorophyll a, Anabaena variabilis, Ribonucleic acid, Substrate utilization.

Several aspects of the metabolism and composition of a strain of Anabaena have been studied during phosphorus deficiency. The effects of medium composition, substrate concentration, temperature, pH, and illumination on alkaline phosphatase activity and phosphate uptake have been examined. Of particular interest among these results was the dependence of maximum alkaline phosphatase activity on Ca and of phosphate uptake on Mg. Depletion of dissolved phosphate from the culture medium was accompanied by a marked increase in alkaline phosphatase activity, initial rate of phosphate uptake, and total amount of phosphate taken up to satisfaction of the phosphorus debt. Readdition of phosphate to a phosphorus-deficient culture resulted in a rapid decline in the ability to take up phosphate but no loss of alkaline phosphatase beyond dilution of activity already present. Entry into phosphorus deficiency was accompanied by a loss of heterocysts, a decline in chlorophyll a, protein, RNA, and cellular phosphorus, and an increase in carbohydrate per unit dry weight. The possible use of these changes as physiological indicators of phosphorus limitation in natural situations is discussed. (Holoman-Battelle)
W74-04905

SOME ASPECTS OF THE ROLE OF USNIC ACID IN FOREST ECOLOGY,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-04979

BOTTOM FAUNA OF GOLCUK LAKE. 1. POPULATION STUDY OF CHIRONOMIDS, CHAOBORUS AND OLIGOCHAETA,
Aegean Univ., Bornova (Turkey).
R. Geldiay, and I. U. Tareen.
Scientific Reports of the Faculty of Science No 137, 1972. 15 p, 5 fig, 2 tab, 9 ref.

Descriptors: *Diptera, *Oligochaetes, *Midges, *Benthic fauna, Eutrophication, Sands, Domestic wastes, Spatial distribution, Seasonal, Habitats, Oxygen, Hydrogen sulfide, Temporal distribution, Organic matter, Nematodes.
Identifiers: *Golcuk Lake(Turkey), Chironomus tentans, Chironomus plumosus, Chaoborus crystallinus, Tubifex tubifex, Chironomux anthracinus, Chaetogaster limnaei, Nais, Lumbriculus, Aelosoma, Stylaria fossularis, Enchytraeus, Ophidonais.

The study of bottom fauna, particularly Chironomid larvae, Chaoborus larvae, and Oligochaeta in Golcuk, a eutrophic mountain lake in western Turkey, emphasized their habitat preference for regions rich in organic matter and their depth distribution in different months. The lake, situated 20 km from the town of Odemis, is alkaline with mean pH value 7.3. Samples were taken for qualititative and quantitative analysis at three stations. In Station 2 population and seasonal variation studies were carried out. The sparse occurrence of the organisms was attributed to the sandy bottom. Where urban drainage from the village of Golcuk takes place, the bottom, characterized by organic mud, was the most productive region of the lake. Tubifex tubifex and Chironomus tentans were abundant and functioned as sewage indicators. The organisms are listed. Station 3, being purely sandy, was poorest in density composition. There was a considerable number of bottom fauna in the littoral which contained dense vegetation. Maximum bottom fauna were found in April. In September, during stratification, oxygen depletion and implementation of hydrogen sulfide caused a decline in total bottom fauna, but Oligochaeta and Chironomus tentans were resistant to hydrogen sulfide toxicity. Chaoborus larvae were most abundant in winter. (Jones-Wisconsin)
W74-05044

A BIOASSAY COMPROMISE,
Connecticut Univ., Storrs. Inst. of Water Resources.
J. R. Cain, and F. R. Trainor.
Phycologia, Vol 12, No 3/4, p 227-232, 1973. 1 fig, 4 tab, 8 ref.

Descriptors: *Analytical techniques, *Bioassay, *Algae, Nutrients, Laboratory tests, Monitoring, Connecticut, Growth rates.
Identifiers: *Algal assay, Selenastrum capricornutum, Continuous cultures, Willimantic River(Conn), Natchaug River(Conn), Shetucket River(Conn).

Laboratory procedures are suggested for a quick, reliable, and uncomplicated measurement of the amount of algal growth a body of water can support (its carrying capacity). Selenastrum capricornutum was used as the test organism for assaying nutrient condition of waters. Using an actively growing culture, inoculated, sterile-filtered water was incubated at 22C in continuous fluorescent illumination. Organisms were grown in tubes on a roller tube rotator, and transferred daily, reestablishing a population of 400,000 cells each day. Averages of 5-day runs showed no evidence of nutrient carry-over when 1 + doublings per day were recorded; carryover usually was not apparent on days 3-5 when nutrient poor waters were examined. Samples were collected near the Willimantic, Connecticut sewage treatment plant at the confluence of Willimantic and Natchaug Rivers. Upstream the Willimantic River receives the discharge from several industries. Downstream from the treatment plant, the Shetucket River was also sampled. This study shows that growth rate of a defined population in a daily transferred culture may be used to measure the ability of surface waters to support algal growth. The procedure suggested meets the basic requirements of simplicity, speed, reproducibility, and applicability to field conditions. (Jones-Wisconsin)
W74-05045

FACTORS AFFECTING THE PHOTOSYNTHETIC CAPACITY OF LABORATORY CULTURES OF THE DIATOM PHAEODACTYLUM TRICORNUTUM,
La Trobe Univ., Bundoora(Australia). Dept. of Botany.
D. J. Griffiths.
Marine Biology, Vol 21, No 2, p 91-97, 1973. 4 fig, 1 tab, 3 ref.

Descriptors: *Photosynthesis, *Biochemistry, *Diatoms, Laboratory tests, Temperature, Chlorophyll, Enzymes, Light intensity, Plant growth.
Identifiers: Phaeodactylum tricornutum.

The relative importance of the two photosynthetic components, enzymatic reactions and light reactions, in controlling the photosynthetic capacity of laboratory cultures of Phaeodactylum tricornutum exposed to a variety of conditions is investigated, and, in a preliminary way, the possible mechanisms involved are explored. The light-saturated photosynthetic capacity of batch cultures of P. tri-cornutum grown in a regime of 16 h light and 8 h dark, reaches a maximum two days before the end of the exponential growth phase and declines thereafter. The fall-off of photosynthetic capacity is more rapid at a higher light intensity. Cultures exposed to a prolonged period of darkness maintain a high photosynthetic capacity. It is possible to reversibly reduce the photosynthetic capacity to a very low level, without significantly affecting the chlorophyll-a concentration by carefully controlling the conditions of dark incubation. Evidence from estimations of chlorophyll-a, total protein, and of the gross pattern of photosynthetic assimilation under different gread of Alberni Inlet and the influence of oceanic, species rich water drawn in through the inlet mouth by way of a subsurface counter current is postulated. (Jones-Wisconsin)
W74-05046

AN EXPERIMENTAL INVESTIGATION INTO EFFECTS OF PULP MILL EFFLUENT ON STRUCTURE OF BIOLOGICAL COMMUNITIES IN ALBERNI INLET, BRITISH COLUMBIA. PART 1: SUBTIDAL COMMUNITIES,
British Columbia Univ., Vancouver. Dept. of Zoology.
J. R. E. Harger, M. L. Campbell, R. Ellison, W. P. Lock, and W. Zwarych.
International Journal of Environmental Studies, Vol 4, No 4, p 269-282, 1973. 24 fig, 1 tab, 35 ref.

Descriptors: *Pulp wastes, *Estuaries, *Biological communities, Canada, Phytoplankton, Intertidal areas, Water pollution effects, Oxygen, Light intensity, Salmon, Light penetration.
Identifiers: *Alberni Inlet(British Columbia), Species diversity.

During the summer of 1971 an investigation into effects on biological communities of effluents discharged from a Kraft paper mill into Alberni Inlet on the west coast of Vancouver Island, British Columbia, was undertaken. The problem of separating effects of fresh water influence on developing communities from those attributable to pulp mill effluent was solved partly by setting a series of roughened formica test panels at a depth of 20 ft throughout the length of the inlet in order that settlement of sessile organisms could be recorded. These plates were also extended into a control area. Structure of communities developing on test panels was investigated using four analytical techniques. This structure indicated simplification, as measured by a number of indices relating to species diversity, and was associated with water transparency as well as other physical factors relating to effluent discharge. A dynamic interaction between influence of dark colored mill effluent in reducing phytoplanktonic production at the head of Alberni Inlet and the influence of oceanic, species rich water drawn in through the inlet mouth by way of a sub-surface counter current is postulated. (Jones-Wisconsin)
W74-05047

PRODUCTION OF A NATURAL POPULATION OF BITHYNIA TENTACULATA L. (GASTROPODA, MOLLUSCA),
Syracuse Univ., N.Y. Dept. of Zoology.
J. S. Mattice.
Ekologia Polska, Vol 20, No 39, p 525-539, 1972. 3 fig, 4 tab, 19 ref.

Descriptors: *Productivity, *Aquatic populations, *Snails, *Biomass, Life cycles, New York, Freshwater, Mortality, Standing crops.
Identifiers: *Bithynia tentaculata, Oneida Lake(N.Y.).

Productivity of a natural population of Bithynia tentaculata, a prosobranch gastropod mollusk, in eutrophic Oneida Lake, New York was estimated from standing crop biomass and mortality. It is a relatively recent immigrant to North America and is replacing the Pleurocerid in this climate. Biomass was estimated using two basic units: tissue dry weight and total organic carbon. Regular growth samples revealed that Bithynia lives for 17 to 18 months and shows a typical growth curve for a freshwater snail in a harsh temperate environment. Field density counts were combined with analyses of total organic carbon of snails at selected times of the year to yield assessments of population biomass. Mortality data, obtained from comparative density measurements and collections of empty shells made possible the estimate of carbon lost from the population over a 12 month period. The sum of the difference between the standing crop biomass in June of two consecutive years and the carbon lost to mortality in the interim gave a value for productivity of the population of 511 mg/C/sq m/year. (Jones-Wisconsin)
W74-05049

SPATIAL DIFFERENTIATION AND CHANGES IN TIME OF ZOOMICROBENTHOS IN THREE MASURIAN LAKES,
Warsaw Univ. (Poland). Zoological Inst.
K. Prejs, and A. Stanczykowska.
Ekologia Polska, Vol 20, No 45, p 733-745, 1972. 7 fig, 3 tab, 12 ref.

Descriptors: *Benthic fauna, *Lakes, *Spatial distribution, Temporal distribution, Microorganisms, Nematodes, Oligochaetes, Copepods, Crustaceans, Diptera, Dominant organisms, Littoral, Profundal zone.
Identifiers: *Mikolajskie Lake(Poland), Sniardwy Lake(Poland), Taltowisko Lake(Poland), Ostracoda, Tardigrada.

In a 6-year study of zoomicrobenthos of three Polish Masurian lakes, differences were recorded in samples between stations at the same depth, composition, and numerical dynamics in number and qualitative composition. Lake Mikolajskie is eutrophic, holomictic; Lake Sniardwy, eutrophic, polymictic; and Lake Taltowisko, mezotrophic, holomictic. The zoomicrobenthos groups distinguished were Nematoda, Oligochaeta, Copepoda, Cladocera, Ostracoda, Chironomidae, and Tardigrada. Differences in numbers were not great and were independent of density and qualitative composition. From littoral to profundal, the highest number was in the littoral, lowest in the sublittoral; a similar distribution of systematic groups in all profiles, constant domination of Nematoda in shallow parts and a decrease in their number with increasing depth, were found. Determination of changes in zoomicrobenthos number and composition during the 6 years at the same stations in the profundal zone showed that the polymictic Lake Sniardwy has a relatively constant number but domination of particular animal groups varies. Holomictic Mikolajskie Lake displays changes in number with a growth tendency in the last years but with a relatively constant domination of one group. (Jones-Wisconsin)
W74-05050

SPATIAL DIFFERENTIATION ABUNDANCE OF BACTERIA IN THE WATER OF MIKOLAJSKIE LAKE,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
W. A. Godlewska-Lipowa, and I. Jablonska.
Ekologia Polska, Vol 20, No 28, p 367-371, 1972. 2 fig, 2 tab, 3 ref.

Descriptors: *Bacteria, *Lakes, *Spatial distribution, Sewage effluents, Microbiology.
Identifiers: *Mikolajskie Lake(Poland).

Water samples were taken in 12 places along the main axis of Mikolajskie Lake, Poland some distance from shore in the vicinity of municipal sewage flow and at the connection with lakes Sniardwy and Beldany. Samples were taken from surface to bottom every 2-5 m at each site. Filtered samples were analyzed to calculate total number of dominant bacteria, that is, cocciforms, rodforms bacilla. The differences found between particular samples, and even particular filters, were relatively small. Bacteria numbers ranged within 4900-7900 thousands/ml of water on the lake surface and 4000-10,000 thousands/ml at other depths at the various stations. Greater abundance of bacteria was observed close to the municipal sewage inflows and at the connection with lakes Sniardwy and Beldany. Great bacterial abundance was found at the depths of 5 and 10 m, on a site possibly near sewage inflow. A considerable preponderance of cocci forms over the bacilliforms and rod-forms indicated that the organic substance flowing into the lake is easily assimilated and becomes quickly mineralized. There was a small percentage of positive Gram bacteria of bacilliform, ranging from 1-3% to 14%. (Jones-Wisconsin)
W74-05051

ASCORBIC ACID AND HETEROCYST DEVELOPMENT IN THE BLUE-GREEN ALGA ANABAENA AMBIGUA,
Banaras Hindu Univ., Varanasi (India). Lab. of Algal Physiology.
C. K. Wahal, N. C. Bhattacharya, and F. R. S. Talpasayi.
Physiologia Plantarum, Vol 28, No 3, p 424-429, 1973. 6 fig, 21 ref.

Descriptors: *Cytological studies, *Anabaena, *Organic acids, Nitrogen, Enzymes, Metabolism.
Identifiers: *Ascorbic acid, *Heterocyst production, Anabaena ambigua.

The role of ascorbic acid in heterocyst development is examined in a strain of Anabaena ambigua. It was cultivated with combined nitrogen and with molecular nitrogen. The amount of different forms of ascorbic acid found in the alga grown with and without combined nitrogen is given. The L-ascorbic acid content of the alga containing heterocysts was always higher than that present in the alga lacking the heterocysts, whether the alga was exposed to light or kept in darkness. The ratio of heterocysts to vegetative cells increased considerably under the influence of ascorbic acid. Thus it appeared that the effect of iso-L-ascorbic acid was about the same as that of L-ascorbic acid. Exogenously added ascorbic acid, up to 0.5 mg/ml, increased the heterocyst frequency to nearly three times that of the control. D-isoascorbic acid, an analogue of ascorbic acid, also showed an enhancement of heterocyst production. The exact location of the enzyme in the alga is not known although the heterocysts were earlier shown to contain ascorbic acid. Cytochemical tests, however, indicated strong peroxidase activity in the heterocysts. (Jones-Wisconsin)
W74-05052

SYNCHRONOUS CULTURES OF CHLAMYDOMONAS REINHARDTI: PROPERTIES AND REGULATION OF REPRESSIBLE PHOSPHATASES,
Bergen Univ., Norway. Botanical Laboratory.
T. Lien, and G. Knutsen.
Physiologia Plantarum, Vol 28, No 2, p 291-298, 1973. 11 fig, 20 ref.

Descriptors: *Cytological studies, *Chlamydomonas, *Enzymes, Phosphates, Phosphorus, Proteins, Synthesis.
Identifiers: *Repressible phosphatases, Derepression.

In synchronously growing Chlamydomonas cells, phosphatase activities in -P and +P medium, de novo synthesis (derepression) of phosphatase in cells grown in -P medium, variation in TCA soluble inorganic and organic phosphate during phosphatase derepression, and effect of orthophosphate and cycloheximide on derepression of phosphatase are reported. A double labelling isotope technique coupled with cellulose acetate electrophoresis were used. Repressed and derepressed phosphatase exhibited different enzymatic properties. Especially the acid phosphatase was located near the cell surface. Inorganic, cold TCA-extractable P-32, decreased during the first 1-2 h after phosphate deprivation when there was little or no net synthesis of phosphatase. Results of experiments with additions of orthophosphate and cycloheximide to derepressed cells, indicated that the derepressible enzyme was relatively unstable, while its m-RNA was relatively stable. Of ecological significance is the attachment of the enzyme to the cell surface, and the excretion of enzyme during sporulation. This may enable cells in growth media with low orthophosphate contents to hydrolyze extracellular phosphate esters and consequently increase the amount of available orthophosphate. This mechanism is made more efficient by the increased substrate affinity of the derepressed enzyme. (Jones-Wisconsin)
W74-05053

BIOMASS MONITORING OF ALGAL CULTURES BY FLUORIMETRIC MEASUREMENT OF THEIR CHLOROPHYLL CONTENT,
Swedish Water and Air Pollution Research Lab., Stockholm.
T. Larsson.
In: Proceedings from A Nordic Symposium, October 25-26, 1972, Oslo, Norway, p 59-61.

Descriptors: *Analytical techniques, *Algae, *Fluorometry, *Bioassay, Biomass, Monitoring, Cultures, Chlorophyll, Nutrients, Trace elements, Phosphates, Chelation.

The effects of trace elements, a chelating agent, and phosphate on algal growth were studied in two factorial experiments. Scenedesmus quadricauda and Raphidonema spiculiforme were cultivated in media, whose concentrations of the above substances were varied simultaneously. Growth was measured by fluorimetric determinations of in vivo chlorophyll and sometimes also by microscopic cell count. Highly significant correlations were found between these two methods of biomass monitoring. Results of the experiments show that fluorimetric measurement of in vivo chlorophyll is a useful method for assessing growth in algal experiments. From the analysis of variance, and due to problems of using chlorophyll concentration to assess biomass, fluorimetric measurements of algal growth should be controlled by a method which measures biomass more accurately, for instance by analysis of cell carbon or cell counting with an electronic particle counter. It is thus important to measure biomass with one of these methods at a time when the analytical results will give much information concerning the objectives of the experiment. Such a time can be chosen with the guidance of fluorimetric determination of in vivo chlorophyll. (Jones-Wisconsin)
W74-05055

FIELD EXPERIMENT ON THE FACTORS CONTROLLING PRIMARY PRODUCTION OF THE LAKE PLANKTON AND PERIPHYTON,
Polish Academy of Sciences, Warsaw. Inst. of Ecology; and Polish Academy of Sciences, Warsaw. Dept. of Hydrobiology.
A. Hillbricht-Ilkowska, A. Kowalczewski, and I. Spodniewska.
Ekologia Polska, Vol 20, No 25, p 315-326, 1972. 7 fig, 1 tab, 10 ref.

Descriptors: *Primary productivity, *Lakes, *Plankton, Periphyton, Photosynthesis, Algae,

Spatial distribution, Light penetration, Eutrophication, Chlorophyll, Diatoms.
Identifiers: Mikolajskie Lake(Poland), Phaeophytin.

Two experiments with plankton and one with periphyton in Mikolajskie Lake of the Masurian Lakeland were conducted to distinguish the influence of light on algae production at various depths. Plankton was sampled at 8 different depths; periphyton from Potamogeton perfoliatus leaves at 5 depths. Primary productivity was estimated by the light-dark bottle technique. Oxygen, chlorophyll, and phaeophytin were determined; total biomass and dominant species estimated. Diatoms were dominant in plankton and many small forms were found during the spring experiment. Algal biomass was then about 5.0 mg/l, and vertical distribution of algae from 0 to 15 m of depth was relatively uniform. Dominance of dinoflagellates was observed during the summer experiment with plankton. Visible concentrations of dinoflagellates capable of active movements were found in the layers 1-2 m and 6-8 m. In both plankton experiments there were no basic differences in species composition of algae at particular depths. Plankton collected from all depths during the spring experiment, including the samples from 10 and 15 m, showed similar production values at all suspension depths. Results suggest varying photosynthetic algal activities from different depths. Highest photosynthetic activity in the summer plankton was found at depths of 3 and 5 m. (Jones-Wisconsin)
W74-05056

PROBLEMS OF THE CONSERVATION OF FRESHWATER ECOSYSTEMS,
Nature Conservancy, Edinburgh (Scotland).
N. C. Morgan.
In: 'Conservation and Productivity of Natural Waters,' Symposia of the Zoological Society of London, No. 29, p 135-154. Academic Press, London, 1972.

Descriptors: *Water conservation, *Preservation, *Natural resources, Management, Europe, Wetlands, Protection, Reservoirs, Water policy, Aquatic life, Estuaries, Wildlife, Recreation, Water pollution effects, Agriculture, Forestry, Insecticides, Herbicides, Farm wastes, Aesthetics, Aquatic plants, Systematics.
Identifiers: *Nature Conservancy(Scotland), United Kingdom, Chalk aquifers.

The discussion centers on the major problems in the United Kingdom and some of the steps taken by the Nature Conservancy and other organizations in conserving freshwaters with the intention of maintaining their scientific interest or rehabilitating their physical, chemical, or biological quality. With the objective to select a series of high quality sites as National Nature Reserves to represent the range of variation of this habitat, reference is made to the problems of water abstraction and storage reservoirs with their varying water levels resulting from specific usage. The effects of irrigation and abstraction of water from chalk aquifers and their effects on river flow, and increasing pressures to use open water for recreation and the consequent effects on conservation of habitat and wildlife particularly near large cities are discussed as well as domestic pollution and the effects of various agricultural practices, particularly in relation to nutrient levels in drainage water. The decline of aquatic vegetation in some water bodies is recorded and possible causes mentioned. The extensive use of herbicides for clearing drainage ditches and the side effects on other components of the ecosystem are considered. (Auen-Wisconsin)
W74-05057

BIOENERGETICS OF THE ASSIMILATING CELLS OF CHLORELLA PYRENOIDOSA CHICK. II. RELATION OF CYCLIC AND NON-CYCLIC PHOTOPHOSPHORYLATION TO PHOTOSYNTHETIC CO2 FIXATION,
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
T. A. Glagoleva, M. V. Chulanovskaya, and O. V. Zalenskii.
Photosynthetica, Vol 6, No 4, p 354-363, 1972. 3 fig, 2 tab, 34 ref.

Descriptors: *Chlorella, *Biochemistry, *Photosynthesis, Cycles, Cytological studies, Light, Carbon cycle.
Identifiers: *Photophosphorylation, Calvin cycle.

Regular changes of relative rates of cyclic and non-cyclic photophosphorylation were investigated and compared with rates of photosynthetic carbon dioxide fixation and oxygen evolution under varying irradiance and temperature. Rate of photoassimilation of glucose was determined by counting the radioactivity of Chlorella pyrenoidosa cells starved of carbohydrates. Rate of starch biosynthesis was estimated by C-14 incorporation. At 670 nm rate of carbon dioxide fixation was 3 times greater at 38C than at 10C and the incorporation of C-14 into starch 2.8 times. Incorporation of C-14 into starch at 714 nm depends on temperature only between 10-20C. From these tests, the relative contribution of cyclic photophosphorylation in the processes immediately unrelated to the Calvin cycle can be estimated. These data testify that interrelations of energy sources in uptake of substances and ions and in the biosynthesis of macromolecules (polysaccharides and proteins) vary under different experimental conditions. Upon increase in rate of photosynthetic gas exchange, relative contribution of non-cyclic photophosphorylation to the realization of these processes also increases and under a certain set of conditions can amount to half of the 'summary' rate of photophosphorylation. (Jones-Wisconsin)
W74-05059

AERATION SYSTEM REVITALIZES LAKES.
Civil Engineering, American Society of Civil Engineers, May 1971. p 107. 1 fig.

Descriptors: *Aeration, *Lakes, *Rehabilitation, Oxygenation, Destratification, Ohio, Illinois, Michigan, Algal control, Freezing, Waste water treatment, Technology.
Identifiers: *Air Aqua systems.

If enough wastes are dumped into a lake, there comes a point when oxygen consumption of wastes and decaying algae is greater than oxygen introduced from air and by living algae. Then even natural exchanges of water strata cannot provide adequate oxygen. During the past decade, several decaying lakes in the Midwest have been restored to healthy conditions through use of the 'Air-Aqua' aeration system which introduces air to the lake bottom. This system overcomes eutrophication by artificially inducing vertical circulation of lake water and thus increasing the oxygen content of the bottom water layer. The small size of the bubbles is the key to the system as tiny bubbles dissolve oxygen more quickly into the bottom water than would those of large diameter. Not only does a large turnover of water occur in a short time, but no turbulence is created thus no sediment is brought to the surface. Three applications of the system in Ohio, Illinois, and Michigan are given, illustrating its ability to restore decaying lakes to balanced ecosystems in which fish and water fowl can thrive. (Jones-Wisconsin)
W74-05060

NUTRIENT STUDIES IN HYPERFERTILIZED ESTUARINE ECOSYSTEMS. I. PHOSPHORUS STUDIES,
Gulf Coast Research Lab., Ocean Springs, Miss.
W. Abbott.
Advances in Water Pollution Research, Vol 4, No II-3240, p 729-739, 1970. 2 fig, 5 tab, 27 ref. FWPCA Grant WP-01030-01.

Descriptors: *Eutrophication, *Phosphorus, *Cycling nutrients, Phosphorus compounds, Nitrates, Productivity, Photosynthesis, Respiration, Ecosystems, Chlorophyll, On-site laboratories.
Identifiers: *Orthophosphate, Total phosphate.

It was established on a pseudokinetic, long-term basis that some experimental systems assimilated exogenous dissolved orthophosphate according to a first-order, presumptively sorption-limited, reaction scheme. Further, photosynthetic production and community respiration were correlated with nitrate and phosphate fertilization. Relevant field studies are reported. Three forms of phosphorus were defined: dissolved, labile, and bound. Analyses were carried out for orthophosphate or total phosphate on each phosphorus fraction. Of nitrogen forms, only nitrate was monitored. Eighteen experimental ponds were constructed by capturing a small bayou channel and fertilized. Trends evident by passage of P-32 through the pond environment suggest a steady-state ecological phosphorus processing machine. Differences between fertilized and control ponds indicate that a demand system probably controls allocations to various ecosystem sub-units. From this standpoint, at least relative to phosphorus, an estuary is not a 'nutrient trap' but is, rather, a 'nutrient buffer' tending to modulate phosphorus flow through the ecosystem while obviating wild fluctuations in the phosphorus economy. Sediments, in this context, are the phosphorus stockpile. Periodically, turbulence effects cycle part of this stored reserve. Metabolic demands within the community may withdraw any required phosphorus from the flux and the excess is soon returned to the stockpile. (Jones-Wisconsin)
W74-05061

TROPHIC RELATIONS OF AQUATIC INSECTS,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins.
Annual Review of Entomology, Vol 18, p 183-206, 1973. 6 fig, 3 tab, 72 ref.

Descriptors: *Animal behavior, *Trophic level, *Aquatic insects, *Food habits, Nutrients, Respiration, Food chains, Energy budget, Cycling nutrients, Systematics, Freshwater, Digestion, Diptera.
Identifiers: Hemiptera, Tanypodinae, Orthocladinae, Diamesinae.

Successful rehabilitative or management strategy of freshwater ecosystems must rely on knowledge of their structure and function. A basic facet is material cycling and energy flow. Significant portion of such cycling and flow involves processing of various forms of organic matter by freshwater invertebrate animals, especially insects, substantiating the interest in aquatic insect trophic relations-food intake, tissue assimilation, and waste release. Nutritional requirements of aquatic insects may be broadly classed as two somewhat distinct problems: intake of adequate calories to meet immediate energy costs and to accumulate energy stores; and sufficient procurement of protein to sustain adequate growth. Differences within a single species are reported. Discrepancies in food habits of the net-spinning caddis larva, Hydropsyche betteni, are described. In addition to trophic differences between two populations of the same species from different locations, age-specific variations within the same population are indicated. In general, Tanypodinae are predaceous, Orthocladinae are detrital-algal feeders, Diamesinae are algal feeders, and Chironomidae are algal-detrital feeders with some leaf mining and predaceous species. The contention is supported that most aquatic insects are best termed polyphagous or generalists and that availability, usually delineated by food particle size and texture, is the key to trophic relationships among aquatic insects. (Jones-Wisconsin)
W74-05062

CONTROL OF ALGAE BY MIXING,
New Hampshire Water Supply and Pollution Control Commission, Concord.
For primary bibliographic entry see Field 5G.
W74-05064

PHOTOSYNTHETIC RATES IN RELATION TO NITROGEN RECYCLING AS AN ADAPTATION TO NUTRIENT DEFICIENCY IN PEAT BOG PLANTS,
Department of Agriculture, Ottawa (Ontario). Plant Research Inst.
E. Small.
Canadian Journal of Botany, Vol 50, No 11, p 2227-2233, 1972. 2 fig, 2 tab, 5 ref.

Descriptors: *Cycling nutrients, *Nitrogen, *Bogs, *Plants, Deficient elements, Peat, Absorption, Phosphorus, Potassium, Leaves, Photosynthesis.
Identifiers: Ottawa(Canada), Evergreen plants, Deciduous plants.

Bog evergreens may primarily represent a mechanism to retain and use nutrients. Perennial leaf duration, high reabsorption of nutrients before leaf fall, and high rates of photosynthesis contribute to maximum use of an acquired unit of nutrient element. Efficiency of the interaction of these three factors in evergreens as contrasted with deciduous species, and in bog species as compared with species of other habitats, is examined. Fifteen species in a raised sphagnum peat bog were compared with 13 non-bog species with respect to light-saturated net photosynthetic rate, and content of N, P, and K within foliage and leaf litter. Bog species reabsorb a greater proportion of the nitrogen from their leaves preceding leaf fall, than do non-bog deciduous species. When bog deciduous species are compared with non-bog deciduous species, they are potentially capable of manufacturing an average of about 60% more photosynthate for an acquired unit of nitrogen. Bog evergreens can potentially manufacture an average of about 235% more photosynthate per acquired unit of nitrogen than can bog deciduous species. (Jones-Wisconsin)
W74-05065

LIMNOLOGICAL SURVEY OF LAKES MICHIGAN, SUPERIOR, HURON AND ERIE,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. L. Schelske, and J. C. Roth.
Publication No. 17, 1973. 108 p, 15 fig, 35 tab, 143 ref, 1 append.

Descriptors: *Limnology, *Great Lakes, *Biological communities, *Biological properties, *Physicochemical properties, Lake Michigan, Lake Superior, Lake Huron, Lake Erie, Analytical techniques, Water temperature, Light penetration, Dissolved oxygen, Alkalinity, Ions, Nutrients, Chlorophyll, Photosynthesis, Phytoplankton, Benthos, Zooplankton, Systematics, Bottom sediments.

Extensive physical, chemical, and biological information was gathered with uniform methods from 87 stations in Lakes Michigan, Superior, Huron and Erie in the summer of 1970. Data include temperature, transparency, dissolved gasses pH, alkalinity, major ions, nutrients, chlorophyll, carbon fixation by phytoplankton, zooplankton, and benthos. On the basis of limnological characteristics, the lakes are divided into ten distinct geographical zones and data on some of the parameters are compared for the ten zones. Temperature regimes vary greatly due to latitude, depth, and sampling time. In the central basin of Lake Erie, the mean surface temperature was compared with the mean concentration of dissolved oxygen. Calcium and alkalinity values are largely controlled by mineralogical characteristics of the drainage basins, whereas inputs of sulfate and chloride are largely urbanization and industrialization products. Absolute levels of silica and nitrate nitrogen in Lake Huron are controlled largely by nutrient concentrations in inputs from Lakes Michigan and Superior. Depletion of silica and nitrate in the epilimnion increases with increasing eutrophication. The lakes ranking in order of most oligotrophic to most eutrophic are Superior, Huron, Michigan, and Erie, with Saginaw Bay being as eutrophic as parts of Lake Erie. (Jones-Wisconsin)
W74-05067

HYDROBIOLOGICAL STUDIES 2.
Ceskoslovenska Akademie Ved, Prague.
Academia Publishing House of the Czechoslovak Academy of Sciences, Prague. 1973. 348 p, 154 fig, 62 tab, 322 ref.

Descriptors: *Hydrobiology, *Limnology, *Hydrology, *Chemical properties, *Physical properties, *Biological communities, Primary productivity, Plankton, Benthos, Model studies, Stratification, Hydrodynamics.
Identifiers: *Vltava Cascade(Czechoslovakia), Slapy Reservoir(Czechoslovakia), Orlik Reservoir(Czechoslovakia), Vrane Reservoir(Czechoslovakia), Stechovice Reservoir(Czechoslovakia), Sazava River(Czechoslovakia).

Results of 10-year systematic observations of the limnology of riverine Slapy Reservoir and the Vltava Cascade consisting of a chain of three main reservoirs and four re-regulation reservoirs in Czechoslovakia are discussed. Critical periods enabling determination of underlying cause and effect relationships were revealed and the complex reservoir hydrodynamics are evaluated. An empirical thermal model for an isolated reservoir and a reservoir in the cascade is calculated. The changes that occurred in the Slapy Reservoir after filling of the new Orlik Reservoir, located above Slapy on the Vltava River, are indicated. Also discussed are the phytoplankton species and their activity and how benthic observations on Slapy Reservoir showed wide differences in organic matter supply and the cessation of this supply after upstream Orlik Reservoir became operative. Fish feeding activity in the littoral, sublittoral and the profundal zones was studied. Investigation results are reported of two re-regulation reservoirs with short retention times and differing inflowing waters. Primary production in relation to discharges and stratification, and quantitative relation of phyto- and zooplankton are indicated and whether the chemical or bacteriological composition of water is changed after passage through a reservoir with short retention time, and if some features characteristic of static waters develop. (See W74-05069 thru W74-05074) (Jones-Wisconsin)
W74-05068

EFFECT OF AN UPSTREAM RESERVOIR ON THE STRATIFICATION CONDITIONS IN SLAPY RESERVOIR,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
M. Straskraba, J. Hrbacek, and P. Javornicky.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 7-82. 36 fig, 5 tab, 81 ref.

Descriptors: *Reservoirs, *Thermal stratification, Dissolved oxygen, Hydrogen ion concentration, Alkalinity, Seasonal, Temperature, Heat budget, Mathematical studies, Hydrology, Water flow, Air temperature, Light penetration, Chemical stratification, Hydrodynamics.
Identifiers: *Slapy Reservoir(Czechoslovakia), Orlik Reservoir(Czechoslovakia), Vltava Cascade(Czechoslovakia).

How basic physical and chemical limnology changes when a primarily isolated high discharge-volume riverine reservoir becomes a lower part of a cascade, and the effect of an upstream reservoir on stratification and horizontal distribution of basic physical and chemical values of the original reservoir (Slapy) in the Vltava Cascade were studied. As derived from direct comparison of two medium discharge years, the shift in time of temperature maxima of the outflowing river is doubled and there is a twofold winter temperature increase in the post-Orlik period. A similar shift of surface seasonal maxima and increase of winter temperatures was observed. Stratification was more pronounced and epilimnium thicker in the post-Orlik years. The S-shaped dissolved oxygen, pH, and alkalinity depth curves resulting from layering of the inflow to intermediate depth changed to regular curves when deep cold water of Orlik fed Slapy. During the years when Orlik was operating the minimum heat content and minimum surface temperatures were linearly positively dependent on the minimum monthly mean air temperature, which in turn is a positive logarithmic function of winter discharges. The complex hydrodynamics of reservoirs is discussed. An empirical thermal model for an isolated reservoir and a reservoir in the cascade is obtained. (See also W74-05068) (Jones-Wisconsin)
W74-05069

CHANGES OF SOME CHEMICAL CONSTITUENTS AND BACTERIAL NUMBERS IN SLAPY RESERVOIR DURING EIGHT YEARS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
L. Prochazkova, V. Straskrabova, and J. Popovsky.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 83-154. 35 fig, 15 tab, 66 ref.

Descriptors: *Chemical properties, *Bacteria, *Reservoirs, Eutrophication, Phosphorus, Ammonia, Nitrogen, Chemical oxygen demand, Biochemical oxygen demand, Biomass, Organic matter, Primary productivity, Coliforms, Decomposing organic matter, Discharge(Water), Conductivity, Alkalinity, Chlorides.
Identifiers: *Slapy Reservoir(Czechoslovakia), Orlik Reservoir(Czechoslovakia), Vltava River(Bohemia).

Changes that occurred in Slapy Reservoir after filling of the new Orlik Reservoir, located above Slapy on the Vltava River, Czechoslovakia were evaluated together with other external and internal factors on long-term changes in chemical and bacteriological characteristics of the reservoir surface. Nitrate concentration increased steadily with increased nitrogen fertilization in the river drainage area. About 25% of the total nitrogen supplied in fertilizers and atmospheric precipitation entered the reservoir; increase of phosphorus fertilizers had no effect on the total phosphorus in the reservoir. A significant indirect correlation of primary production with ammonia-nitrate concentration was observed. An indirect correlation was found between primary production and phosphate-phosphorus concentration. The N/P ratio increased after the construction of Orlik Reservoir to about 40. The sums of COD, BOD-5 corrected for algal biomass, direct counts on beef-peptone-agar (BPA) 10 days and 5 days coliforms showed a direct significant correlation to mean water discharge. The effect of Orlik Reservoir on decrease of COD and BPA-10 bacteria at the Slapy Reservoir surface was observed at the beginning of the second year after filling of Orlik; on direct bacteria counts from the third year, and on BOD-5 from the fourth year onwards. (See also W74-05068) (Jones-Wisconsin)
W74-05070

THE CHANGES IN SEVERAL PARAMETERS OF PLANKTON PRIMARY PRODUCTIVITY IN SLAPY RESERVOIR 1960-1967, THEIR MUTUAL CORRELATIONS AND CORRELATIONS WITH THE MAIN ECOLOGICAL FACTORS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.

P. Javornicky, and J. Komarkova.
In: 'Hydrobiological Studies 2, 'Academia Publishing House, Prague. 1973. p 155-211. 33 fig, 6 tab, 55 ref.

Descriptors: *Plankton, *Primary productivity, *Reservoirs, Phytoplankton, Photosynthesis, Biomass, Chlorophyll, Algae, Solar radiation, Temperature, Phosphorus, Discharge(Water), Seasonal, Diatoms, Anabaena, Stratification, Cyanophyta, Light penetration, Chlorophyta.
Identifiers: *Slapy Reservoir(Czechoslovakia), Vltava Cascade(Czechoslovakia).

Results of an 8-year study of Slapy Reservoir, Czechoslovakia are given in connection with phytoplankton species, phytoplankton photosynthetic activity relationahip to biomass percentage of main phytoplankter groups, seasonal changes in parameters of plankton primary productivity, seasonal average of these parameters, mutual correlations between these parameters, and correlations between parameters of plankton primary productivity and several ecological factors. Cell volumes of most abundant phytoplankton species are tabulated. Species of algae dominating the phytoplankton biomass in the surface 3-m layer (trophogenic zone) at the standard sampling station during three main periods of the eight seasons of vegetation are listed. Two coefficients of photosynthetic activity of phytoplankton, namely turnover rate in situ and activity in vitro, are considered. Seasonal patterns and their changes during the years investigated are shown and analyzed. The differences between the seasonal averages were tested and the averages as well as the individual data are correlated both mutually and with the following ecological factors: incident solar radiation energy, Secchi disc readings, water temperature, concentration of total phosphorus, and discharge of reservoir water. The last two factors are demonstrated to be the most important for plankton primary productivity in Slapy Reservoir. (See also W74-05068) (Jones-Wisconsin)
W74-05071

THE CHANGES OF BENTHOS IN SLAPY RESERVOIR IN THE YEARS 1960-1961,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
V. Hruska.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 213-247. 10 fig, 10 tab, 62 ref.

Descriptors: *Benthos, *Reservoirs, Temporal distribution, Oligochaetes, Diptera, Tripton, Tubificids, Littoral, Profundal zone, Biomass, Benthic fauna, Organic matter.
Identifiers: *Slapy Reservoir(Czechoslovakia), Orlik Reservoir(Czechoslovakia).

In two consecutive years of benthic observations of Czechoslovakia Slapy Reservoir there were wide differences in organic matter supply brought into the reservoir by the Vltava River. This supply ceased in the second year after upstream Orlik Reservoir became operative. Benthic abundance and biomass were observed at transects 9 km and 33 km above Slapy dam. Additional samples were taken 35 km above the dam. Experiments with four protected bottom areas against fish predation were conducted at the 9 km transect. In 1960, benthos was quantitatively richest in the profundal of both transects. Oligochaeta were most important. In 1961 with the retention of river tripton in the upper Orlik Reservoir the huge quantities of Oligochaeta disappeared from the 33 km transect. he lower profundal became quantitatively the richest zone and changes of abundance and biomass differed from those in the preceeding year. Protection of the bottom areas against fish feeding indicated that differences between the quantitatively poor benthos in the littoral and sublittoral and rich benthos in the profundal must be ascribed to the better food conditions rather than to fish predation. (See also W74-05068) (Jones-Wisconsin)
W74-05072

LIMNOLOGY OF TWO RE-REGULATION RESERVOIRS IN CZECHOSLOVAKIA,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
M. Straskraba, and P. Javornicky.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 249-316. 34 fig, 9 tab, 37 ref.

Descriptors: *Limnology, *Reservoirs, *Thermal stratification, *Temperature, Biomass, Temporal distribution, Stratification, Mathematical models, Phytoplankton, Zooplankton, Chlorophyll, Photosynthesis, Standing crops, Hydrology, Oxygen, Hydrogen ion concentration, Alkalinity, Nutrients, Primary productivity, Discharge(Water).
Identifiers: *Re-regulation reservoirs, Vltava Cascade(Czechoslovakia).

Investigations of two re-regulation reservoirs with short retention times, differing in inflowing water, are reported. Analysis was made of seasonal temperatures and an empirical temperature model developed for Czechoslovak Vltava Cascade and primary production in relation to discharges and stratification, and quantitative relation of phyto- and zooplankton studied. During two years of direct study and evaluation of 10-year data, temperature change within the poorly stratified water mass of the re-regulation reservoir was found to correlate with the air-water temperature gradient and retention time. In the re-regulation reservoir receiving a tributary river in addition to the upper reservoir outflow, the temperature changes were correlated with the mixing of the two inflowing water masses. Species composition, abundance and standing crop of phyto- and zooplankton, as well as the chlorophyll-a content and photosynthetic activity of phytoplankton are explained in connection with the phytoplankton origin of the re-regulation reservoir from the depths of the upstream reservoir. Log ratio phytoplankton production/zooplankton standing crop was found to increase logarithmically in reservoirs with renewal times more than 20 days, but to be renewal independent in highly throughflowing reservoirs. (See also W74-05068) (Jones-Wisconsin)
W74-05073

THE INFLUENCE OF TWO RE-REGULATION RESERVOIRS ON THE CHEMICAL AND BACTERIOLOGICAL PROPERTIES OF RIVER WATER,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
V. Straskrabova, L. Prochazkova, and J. Popovsky.
In: 'Hydrobiological Studies 2,' Academia Publishing House, Prague. 1973. p 317-348. 10 fig, 14 tab, 21 ref.

Descriptors: *Reservoirs, *Chemical properties, *Bacteria, *Rivers, Hardness(Water), Coliforms, Phosphates, Chemical oxygen demand, Biochemical oxygen demand, Phosphorus, Nitrogen, Conductivity, Discharge(Water), Tributaries, Primary productivity, Retention, Nitrates, Ammonia.
Identifiers: *Re-regulation reservoirs, Vrane Reservoir(Czechoslovakia), Slapy Reservoir(Czechoslovakia), Stechovice Reservoir(Czechoslovakia), Vltava River(Czechoslovakia), Sazava River(Czechoslovakia), Vltava Cascade(Czechoslovakia).

Whether the chemical or bacteriological composition of river water is changed after passage through a reservoir with short retention time (several hours to several days) and whether some features characteristic of static waters develop in such reservoirs were investigated. Of the two reservoirs on the Vltava River above Prague, a segment of the Vltava Cascade, Stechovice is supplied by outflow of Slapy Reservoir and Vrane is filled by the Vltava River flowing from Stechovice and by tributary Sazava River. Only significant changes found in the water after passage through Stechovice Reservoir were increases in total hardness, organic nitrogen, and coliform bacteria, and decreases in phosphate-phosphorus, COD and BOD-5. Water passing through Vrane Reservoir showed a significant decrease in COD during low discharge only and an increase in total phosphorus and phosphate-phosphorus, organic nitrogen, specific conductivity, BOD-5, and in numbers of bacterial groups. Bacterial numbers showed an indirect proportion to Vlt ava River discharge. Difference between the BOD-5 concentration in outflow and inflow of Stechovice Reservoir correlated directly with retention time. Difference in ammonia nitrogen concentration in the outflow and inflow of Vrane Reservoir correlated indirectly with primary production of phytoplankton and directly with both discharge of Sazava River and the percentage in the total reservoir discharge. (See also W74-05068) (Jones-Wisconsin)
W74-05074

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED, AND UNDIKED TECHNIQUES--FIRST ANNUAL PROGRESS REPORT,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom, and R. R. Stickney.
Available from the National Technical Information Service as AD-757 717 $6.00 paper copy, $1.45 in microfiche. Army Engineer District, Savannah, Georgia, Report April 1972. 373 p, 170 fig, 49 tab, 16 ref.

Descriptors: *Environmental effects, *Dredging, *Salt marshes, *Dikes, *Spoil banks, Deposition(Sediments), Water quality, Sediments, Biota, Georgia, Coasts, Metals, Estuaries, Aquatic plants, Benthos, Periphyton, Computer programs, Trace elements, Oxidation-reduction potential, Hydrogen ion concentration, Sulfides, Invertebrates, Mathematical studies.
Identifiers: Spartina alterniflora, Diversity indices, Intracoastal waterways, Savannah River(Ga.), Hell Gate(Ga.), Thunderbolt(Ga.).

Nature and magnitude of environmental changes resulting from dredging activities in salt marsh-estuarine environments of the southeastern Atlantic coast are evaluated. Water quality changes where diked and undiked techniques were used, salt marsh sediment responses to deposition of dredged material, and changes in biota were studied where dredging took place. It is concluded that in natural and relatively unpollutted areas dredging has no significant effect on water quality where either diked or undiked techniques were used; in polluted areas, water quality impairment caused by dredging does not necessarily bear any simple relation to composition of sediment to be dredged. Since distribution of trace metals (micronutrients) in various valence states in marsh sediments has a characteristic distribution pattern with depth dependent on Eh, pH, and sulfide, changes occurring in the latter parameters during spoil material deposition can greatly affect distribution of the former. Combination of reduced sediments and micronutrients may be important to the healthy maintenance of the salt marsh plant, Spartina alterniflora. Analyses of data indicate that no effects of dredging on the fishes and macroinvertebrate fauna within the 1971 dredge areas along the Intracoastal Water Ways of Georgia could be delimited. (Jones-Wisconsin)
W74-05075

WORKBOOK OF THERMAL PLUME PREDICTION: VOLUME 1, SUBMERGED DISCHARGE,
Pacific Northwest Water Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5B.

W74-05111

HISTOCHEMICAL AND CYTOPHOTOMETRIC ASSAY OF ACID STRESS IN FRESHWATER FISH.
Pennsylvania State Univ., University Park. Dept. of Biology.
Copy available from GPO Sup Doc as EP1.16:18050OXJ05/4, $1.25; microfiche from NTIS as PB-227 571, $1.45. Environmental Protection Agency, Water Pollution Control Research Series, May 1971. 113 p, 32 fig, 18 tab, 66 ref. EPA Grant No. 18050DXJ.

Descriptors: Fish physiology, *Bioassay, *Acidic water, Water pollution effects, Pennsylvania, Analytical techniques, Microscopy, Bioindicators, Toxins, *Brook trout, Minnows, Spectrophotometry, Spectroscopy, *Fish pathology.
Identifiers: *Fish histochemistry, Analytical histochemistry, Cytophotometry, *Longnose dace, *Fathead minnows, *Acid toxicants.

The feasibility of using histochemical and histopathological changes in brook trout, longnose dace and fathead minnows as bioindicators of acid pollution was investigated. Laboratory studies entailed using a gravity flow diluter system. Field studies involved using net traps in polluted streams. Exposure durations were 4-5 days and 28-30 days. Histochemical cytophotometric analyses were made of gills, Stannius corpuscle, blood, spleen, kidney and liver. The primary mode of acid toxicant action is gill damage which results in impaired respiratory, excretory and liver functions. Short term indices of acid stress include: colloidal iron and PAS staining of gills and renal Stannius corpuscles. A useful bioindicator of prolonged acid exposure is decreased azure B-RNA staining of liver cells; this assesses the extent of liver impairment and reflects of reduced tolerance of fish to other toxicants. Sublethal levels of acidity are not cumulative. However, pH levels of about 5.0 should be considered hazardous since they prove toxic to breeding fish having increased oxygen needs and also reduce the liver's ability to detoxify noxious substances present in acid polluted waters. (EPA)
W74-05113

THE OXYGEN UPTAKE DEMAND OF RESUSPENDED BOTTOM SEDIMENTS.
Seattle Univ., Wash. Dept. of Civil Engineering.
Copy available from GPO Sup Doc as EP1.16:16070DCD09/70, $0.50; microfiche from NTIS as PB-228 263, $1.45. Environmental Protection Agency, Water Pollution Control Research Series, September 1970. 38 p, 11 fig, 6 tab, 15 ref. EPA Project 16070 DCD, Contract 14-12-481.

Descriptors: *Biochemical oxygen demand, *Bottom sediments, *Sludge, Sodium chloride, Salts, Light, Estuaries, Temperature, *Washington, Dissolved oxygen.
Identifiers: *Warburg respirometer, *Bellingham Bay(Wash), *Benthic sludge.

A laboratory study has been conducted to show the application of the Warburg respirometer in evaluating the influence of light, sodium chloride, dilution salts, temperature and agitation on the maximu oxygen uptake rate of disturbed bottom sediments. Experiments were conducted on estuarian benthic material obtained from Bellingham Bay, Washington. In all experiments the initial oxygen uptake rate was the maximum uptake rate. Results obtained using distilled water as the suspending medium were not appreciably altered due to the addition of BOD dilution salts, or sodium chloride in concentrations less than 30,000 mg/l. The initial uptake rate also appears to be insensitive to light. Ambient temperatures were varied from 10C to 20C and agitation settings were varied from instrument maximum to twenty-five percent of maximum. The Squalicum Creek sample showed variations in initial uptake from 2,000 to 57,000 mg/l of oxygen per hour. The Whatcom Creek sample had a range from 2800 to 83,000 mg/l of oxygen per hour. Results indicate that the maximum uptake rate is very sensitive to temperature, degree of disturbance, and the total volatile solids concentration of the benthic material. Agitation alone was shown to account for at least a ten fold increase in the maximum oxygen demand. (EPA)
W74-05114

ENVIRONMENTAL ACTIVITIES AND PROGRAMS AT THE SAVANNAH RIVER PLANT.
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 5B.
W74-05173

RADIONUCLIDES IN ECOSYSTEMS, VOLUME I.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05181

AN ECOLOGICAL APPROACH TO THE EVALUATION OF RADIOACTIVITY WITHIN THE MAN-ENVIRONMENT ECOSYSTEM,
Emory Univ., Atlanta, Ga.
For primary bibliographic entry see Field 5B.
W74-05182

RADIONUCLIDES IN THE ENVIRONMENT AT NUCLEAR POWER STATIONS,
Environmental Protection Agency, Cincinnati, Ohio. Radiochemistry and Nuclear Engineering Branch.
For primary bibliographic entry see Field 5B.
W74-05183

ENVIRONMENTAL ASPECTS OF NATURAL GAS STIMULATION EXPERIMENTS WITH NUCLEAR DEVICES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5B.
W74-05184

CESIUM-137 IN WHITE-TAILED DEER AS RELATED TO VEGETATION AND SOILS OF THE SOUTHEASTERN UNITED STATES,
Eastern Environmental Radiation Lab., Montgomery, Ala.
For primary bibliographic entry see Field 5B.
W74-05190

A PROPOSED MECHANISM FOR THE RECYCLING OF RADIOCESIUM IN FLORIDA SOIL PLANT SYSTEMS,
Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5A.
W74-05192

PERSISTENCE OF RADIONUCLIDES IN SOIL, PLANTS, AND SMALL MAMMALS IN AREAS CONTAMINATED WITH RADIOACTIVE FALLOUT,
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.
For primary bibliographic entry see Field 5B.
W74-05194

THE BIOLOGICAL PATHWAY OF ZINC (ZN-65) IN FRESHWATER FISH AND ITS ALTERATION BY HEAVY METALS,
European Atomic Energy Community, Ispra (Italy). Biology Div.
M. Merlini, F. Argentesi, A. Brazzelli, B. Oregioni, and A. Berg.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 285-306, (1971), 7 fig, 7 tab, 24 ref.

Descriptors: Water pollution, Fish, Absorption, *Zonc, *Toxicity, *Public health, *Radioactivity, Food chains, Ecosystems, Lakes, Radioecology, Biological properties, Path of pollutants, Microbiology, Aquatic microbiology, Mercury, Cadmium, Heavy metals, *Sunfishes.
Identifiers: *Italy(Lake Maggiore).

The biological pathway of Zn-65 was studied in the freshwater fish Lepomis gibbosus, L. from Lago Maggiore (Lake Maggiore) in Northern Italy under different experimental conditions. The results showed that the biological half-times of accumulation (Tba) and the rates of accumulation (k) of radiozinc from water by fish fed rations with 16 ppm of stable zinc and for fish fed a zinc-free diet were significantly different. In the first case, the Tba was 97 days and k was equal to 0.007 per day; whereas in the second case, for fish on a zinc-free diet, the Tba was 27 days and the rate of accumulation was 0.027 per day. Fish without stable zinc in their diet accumulate their body burden at a faster rate than those with zinc in their diet. In addition, fish fed zinc-free ration accumulated significantly more radiozinc than those on a normal diet. Uptake data and bio-elimination half-times for Zn-65 absorbed from water by the fish are given in detail. From the investigations performed it was ascertained that zinc, an essential micronutrient, is homeostatically controlled by fish and that low levels of pollutants such as mercury and cadmium did not affect the total stable Zn content of the animal within the time limits studied. These metals do, however, inhibit the uptake of zinc as Zn-65 and the concentration of the nuclide. (See also W74-05181) (Houser-ORNL)
W74-05201

CYCLING OF ZINC-65 IN A SIMPLE FOOD WEB,
Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.
C. E. Cushing, and D. G. Watson.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 318-322, (1971), 4 fig, 1 tab, 8 ref.

Descriptors: Cycles, *Zinc, *Water pollution sources, Fish, *Carp, *Food webs, Research and development, Model studies, *Columbia River, Radioactivity, Water pollution, Absorption, Measurement, Equilibrium, Retention.

Experiment was designed to investigate the cycling of Zn-65 in a simple water-periphyton-fish food web under constant flow, light, and ambient radionuclide concentration. Water temperature followed the seasonal pattern of the Columbia River. Replicate experimental streams containing periphyton and young carp (Cyprinus carpio) were spiked continuously to maintain Zn-65 concentrations of approximately 1 and 10 pCi/ml - about 20 and 200 times that of the river water. Periphyton and fish were sampled at intervals to ascertain the time necessary to reach equilibrium. Subsequently, the spike was cut off and retention of the Zn-65 was followed. Concentrations of Zn-65 in periphyton approached equilibrium in about 28 days at levels of 17 and 90 nCi/g wet weight in the low- and high-level streams respectively. These represent concentrations of about 23 and 150 times that of the control periphyton and are very close to the differential spike levels in the water. This means that, under the conditions of this experiment, periphyton concentrates Zn-65 in nearly direct proportion to ambient concentrations. The specific activity of the periphyton at equilibrium was 35 and 210 pCi/mg in the low- and high-level streams respectively. The estimated effective half-life was about 15 days. Data on the fish were more variable due to the influence of temperature on metabolic rates. Approximate equilibrium was reached in about 43 days at concentrations of 0.25

and 1.3 nCi/g wet weight in the low- and high-level streams respectively. This represents concentrations of 6 and 29 times that of the control fish. Specific activities at this time were 3 and 20 pCi/mg. These data suggest that true equilibrium in the carp had not been reached. Water temperatures varied from 6 to 18C during the experiment, which ran from January to June. (See also W74-05181) (Houser-ORNL)
W74-05202

THE FATE OF COBALT-60 IN A NATURAL FRESHWATER ECOSYSTEM,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
I. L. Ophel, and C. D. Fraser.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 323-327, (1971) 1 fig, 4 tab, 11 ref.

Descriptors: *Cobalt, *Ecosystem, Freshwater, *Lakes, *Dystrophy, *Eutrophication, Water pollution, Water pollution effects, Assay, Measurement, Radioactivity, Aquatic plants, Fish, Biota, Absorption, Lake morphology, Distribution, Sediments.
Identifiers: *Canada(Perch Lake).

Perch Lake is a small dystrophic-eutrophic lake on the property of Atomic Energy of Canada Limited at Chalk River, Ontario. For seven years it has been receiving at a relatively constant rate small amounts of Co-60 via its inlet stream, resulting in low, but measurable, concentrations of this radionuclide in the lake water. During this time water and food-chain components have been assayed for Co-60 content using a large-volume counter combined with a single-channel gamma-ray spectrometer. Concentration factors were determined for the dominant species of aquatic plants, fish, and other biota. Large differences in accumulation were found between species of plants due to morphology of the plants and their location in the lake. Differences between fish species are correlated with their feeding habits. The vertical and horizontal distribution of radiocobalt in the bottom sediments was investigated. Most of the nuclide is confined to the upper few centimeters of the organic-rich deposits. Calculations indicate that the lake sediment is an important storehouse of cobalt and that approximately 30% of the Co-60 that has entered the lake is now resident on the bottom. (See also W74-05181) (Houser-ORNL)
W74-05203

ECOLOGICAL FACTORS AFFECTING THE ACCUMULATION OF CESIUM-137 FALLOUT BY A NATURAL POPULATION OF LARGEMOUTH BASS, (MICROPTERUS SALMOIDES),
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
S. A. Spigarelli.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 328-333, (1971) 2 fig, 4 tab, 19 ref.

Descriptors: *Cesium, *Fallout, *Ecology, Population, *Largemouth bass, Radioactivity, Absorption, Assay, Measurement, Compatibility, Lakes, Michigan, Speciation, Correlation analysis, *Michigan.
Identifiers: *Wintergreen Lake(Mich).

In order to better define the variable accumulations of Cs-137 fallout by the individuals of a fish population, the effects of selected ecological parameters were tested. Individual fish characteristics (sex and weight), monthly precipitation, and time of year were statistically analyzed for their influence on Cs-137 activities of largemouth bass collected from Wintergreen Lake, Kalamazoo County, Michigan. Monthly collections of bass were analyzed for Cs-137 activity. No significant difference in Cs-137 activity was detected between male and female bass of equal size. However, body weight was a significant factor; larger bass accumulated more Cs-137 and total Cs per unit weight than small bass. The plots of Cs-137 vs weight and total Cs vs weight were very similar and supported the specific activity concept. The relationship between weight and Cs-137 in bass was estimated to be curvilinear with positive slope up to approximately 1000 g and negative slope above 1100 g. Mean Cs-137 activities of bass collected monthly from May to October 1969 were significantly different. The maximum activities occurred during May, the minimum in August. No correlation was demonstrated between monthly precipitation levels and Cs-137 activities of bass. (See also W74-05181) (Houser-ORNL)
W74-05204

RELATIONSHIPS BETWEEN PHOSPHORUS-32 ACCUMULATION IN ALGAE, BACTERIA, AND TUBIFICIDS,
Western Michigan Univ., Kalamazoo. Dept. of Biology.
W. L. Stromberg, and C. J. Goodnight.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 410-416, (1971), 8 fig, 2 tab, 18 ref.

Descriptors: *Phosphorus, Kinetics, *Absorption, *Sorption, Retention, *Algae, *Bacteria, *Tubificids, Water pollution, Radioactivity, Radioactive tracer, Equilibrium, Worms, Ecology, Ecosystems.

Kinetics of accumulation and retention of P-32 were determined for unialgal cultures of Chlorella pyrenoidosa in carrier (52 mg Na2HPO4/liter) and carrier-free Knop's solution (modified) using 10 micron Ci P32/liter as tracer and a Geiger-Mueller counting system. Accumulation in a carrier-free solution was exponential and approached a 90% efficiency of removal within 30 min. In the carrier solution, accumulation was approximately linear and did not reach equilibrium within a 27-hr period. Using ouabain as an inhibitor, it was shown that the observed sorption of radiophosphate in carrier-free solution by this alga was independent of metabolic activity. Most loss of the phosphate taken up in a 27 -hr interval occurred within 1 hr in agitated carrier and carrier-free Knop's solution. Accumulation of P-32 by tubificid worms was also studied using similar counting methods. Uptake by these worms was approximately exponential in media with a bacterial source of radiophosphate, and was reduced by addition of chloramphenicol and removal of P-32 from solution by algae. Preliminary results indicated that C. pyrenoidosa competed effectively with the worms for inorganic phosphate, and that accumulation of P-32 by ingestion of algae among tubificids may be slight. Ecological implications of these results are discussed. (See also W74-05181) (Houser-ORNL)
W74-05206

UPTAKE OF RADIOPHOSPHORUS BY ROOTED AQUATIC PLANTS,
Pacific Northwest Water Lab., Corvallis, Oreg.
D. W. Schults, and K. W. Malueg.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 417-424, (1971), 5 fig, 4 tab, 9 ref.

Descriptors: *Water pollution effects, *Lakes, *Radioisotopes, *Phosphorus, *Absorption, Ion exchange, Root system, Aquatic plants, Water, Sediments, Leaves, Silica, Sands, Transfer, Kinetics.
Identifiers: *Radiophosphorus, Sediment-water nutrient interchange.

Laboratory experiments were conducted to compare the uptake of phosphorus by roots and foliage of Elodea canadensis, Potamogeton amplifolius, and Vallisneria americana and to evaluate the cycling of radiophosphorus between the sediment and the water medium with the plant as the exchange agent. Intact plants were partitioned into root and foliage environments. For the comparison the radiophosphorus isotopes P-32 and P-33 were used simultaneously in the separate environments. Three different root media were evaluated for their influence on phosphorus uptake by the plants: lake water, silica sand saturated with lake water, and lake sediment saturated with lake water. All three species had higher uptake by the foliage than by the roots. For Potamogeton and Vallisneria, uptake by the foliage was greatest for plants rooted in sediment, less for those rooted in sand, and least for those rooted in lake water. For Elodea, uptake by the foliage was not statistically different for the three rooting media. For all experiments, except Vallisneria rooted in sand, there was a direct positive relationship between total uptake and percentage of radiophosphorus derived from the rooting medium. Only about 1% of the radiophosphorus in the foliage medium was transferred downward to the root medium. Up to 54% of the radiophosphorus added to the root medium was transferred through the plant and into the foliage medium. This process may constitute a significant sediment-water nutrient interchange mechanism in the littoral regions of lakes. (See also W74-05181) (Houser-ORNL)
W74-05207

STRONTIUM-90 AND CESIUM-137 IN WATER AND DEEP SEDIMENTS OF THE GREAT LAKES,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
A. Lerman, and H. Taniguchi.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 460-464, (1971), 1 fig, 5 tab, 14 ref.

Descriptors: *Fallout, *Strontium, *Cesium, *Lake sediments, *Great Lakes, *Radioactivity, Lake Ontario, Lake Superior, *Assay, Watersheds(Basins), Sedimentology, Deposition(Sediments), Lake Michigan, Lake Huron, Lake Erie, Transfer, Discharge, Movement, Precipitation(Atmospheric).

Input of Sr-90 into the Laurentian Great Lakes was estimated from the rates of deposition of nuclear fallout in atmospheric precipitation over the lake surface and land drainage basin of each lake, for the period 1954-69. The amount of Sr-90 accumulated in the sediments of Lakes Superior, Michigan, and Ontario is only a small fraction (2-6%) of the total amount introduced into the lakes. The amount of Cs-137 in sediment cores from Lakes Ontario and Superior is 20-35 times greater than the amount of Sr-90. These high concentrations of Cs-137, viewed against the value of 1.45 for the Cs-137/Sr-90 ratio in atmospheric fallout and 0.16-0.36 in the Great Lakes waters, indicate that Great Lakes sediments strongly control the concentration of Cs-137 in lake water. (See also W74-05181) (Houser-ORNL)
W74-05208

CHANGES IN MORPHOLOGICAL COMPOSITION OF THE BLOOD OF LARVAL FISH BITTEN BY WATER BUGS FAM. CORIXIDAE), (IN RUSSIAN),
L. D. Zhiteneva, and N. P. Sokol' skaya.
Vopr Ikhtiol. Vol 12, No 1, p 179-185. 1972. Illus.
Identifiers: *Corxidae, Erythrocyte, Fish morphology, Hemolysis, Larval fish, *Water bugs, Fish blood, *Corp, *Sterlet, Fish pathology, Fish parasites, *Fish poisons.

Blood changes in larvae of 3 different species of fish (pond carp, grass carp and sterlet) following a

bite by water bugs were investigated. The poison of these fish parasites produces a degradation of erythrocytes, and hemolysis. Pathological changes include changes in white blood cells, production of many immature lympho- and leukoblasts. These irreversible processes lead to death of the fish. The most sensitive to the bite are the sterlets.--Copyright 1973, Biological Abstracts, Inc.
W74-05209

UPTAKE OF MOLYBDENUM MARKED WITH MO-99, BY THE BIOTA OF FERN LAKE, WASHINGTON, IN A LABORATORY AND FIELD EXPERIMENT,
Washington Univ., Seattle. Coll. of Fisheries.
Z. F. Short, P. R. Olson, R. F. Palumbo, J. R. Donaldson, and F. G. Lowman.
In: CONF-710501-P1 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 474-485, (1971), 7 fig, 5 tab, 39 ref.

Descriptors: *Radioisotopes, *Molybdenum, *Lakes, Ecosystems, *Radioecology, *Washington, Crayfish, Periphyton, Aquatic environment, Food chains, Trout, Clams, Absorption, Transfer, Nutrient requirement.
Identifiers: *Fern Lake(Wash.).

The bioaccumulation of molybdenum, marked with Mo-99, was followed in month-long studies in an aquarium, where water, not food, was the major source of the nuclides, and in Fern Lake, where assimilation by organisms isolated in live-boxes was compared with assimilation by those with access to their usual sources of food. In the aquarium containing 3.3 ppm of the metal, the alga Nitella flexilis accumulated up to 130 ppm molybdenum, a 'luxury' amount. In Fern Lake, with 0.014 ppb, the maximum concentration in the N. flexilis was 8.8 ppb. Uptake in the lake was irregular because of local chemical conditions in the water. The concentration in periphyton from the lake shore-line reached 50 ppb. All the tissues dissected from clams, crayfish, and trout, in the aquarium contained some molybdenum. In trout the least amounts were in the gastrointestinal tract. In the lake, small amounts were in a few trout held without food in the live-boxes, but concentrations were upto 16 ppb in the gastrointestinal tract and liver of fish which were free to feed. The concentrations in the liver of fingerlings exceeded that in the yearlings by a factor of 4. (See also W74-05181) (Houser-ORNL)
W74-05210

EFFECT OF ORGANIC INSECTICIDES UPON CARBON-14 UPTAKE BY FRESHWATER PHYTOPLANKTON,
Florida Technological Univ., Orlando. Dept. of Biological Sciences.
D. H. Vickers, and C. E. Boyd.
In: CONF-710501-P1-Proceedings of the Third National Symposium on Radioecology, May 10-12, (1971), Oak Ridge, Tenn. p492-496, 1971, 4 fig, 1 tab, 8 ref.

Descriptors: *Organic pesticides, *Carbon radioisotopes, *Absorption, Freshwater, *Phytoplankton, Effects, Measurement, Bioassay, Chlorophyll, Ecosystems, *Water pollution effects, *Insecticides.

The effect of ten organic insecticides upon carbon dioxide fixation by phytoplankton was measured in situ by the C-14 bioassay technique. The following insecticides were tested individually at concentrations of 10 ppm: dieldrin, endrin, DDT, toxaphene, malathion, methyl parathion, mirex, sevin, metacil, and furadan. Only the carbamates (sevin, matacil, and furadan) and toxaphene consistently inhibited C-14 uptake under the test conditions. Further tests with the carbamates revealed that concentrations of 3 to 5 ppm of sevin and matacil resulted in about 50% reduction of C-14 uptake as compared with C-14 uptake by the control. Concentrations of 15 ppm of these two compounds almost completely inhibited C-14 uptake. A similar response curve was obtained for furadan, but C-14 uptake was reduced by only 60% at 15 ppm of this insecticide. The carbamate compounds greatly reduced concentrations of chlorophyll A in phytoplankton cultures within 24 hr. (See also W74-05181) (Houser-ORNL)
W74-05211

SOME ECOLOGICAL CONSIDERATIONS IN LOCATING A NUCLEAR-POWERED ELECTRICAL GENERATING FACILITY ON THE NORTH ANNA RIVER, VIRGINIA,
Virginia Commonwealth Univ., Richmond.
G. M. Simmons, Jr., and J. R. Reed, Jr.
In: CONF-710501-p1-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridg,e Tennessee. p 497-510, (1971) 15 fig, 5 tab, 10 ref.

Descriptors: *Water pollution effects, *Aquatic environment, Rivers, *Ecosystems, *Virginia, Nuclear powerplants, Lake impoundments, Reservoir storage, Reservoir releases, Direct benefits, Real benefits, Induced benefits, Ecology.
Identifiers: *North Anna River(Va.).

The North Anna River is a major tributary of the York River, which empties into the Chesapeake Bay. The ecological properties of a major portion of the North Anna River have been severely altered by more than 100 years of acid drainage from abandoned iron pyrite mines. Virginia Electric and Power Company is constructing a 13,000-acre impoundment within the disturbed area to provide cooling water for a 4,000,000-kW nuclear-powered electrical generating facility. Results from a preimpoundment study and inspection of the proposed reservoir construction and operation indicate that the facility will have a beneficial effect on the ecological properties of the lower North Anna River basin by accelerating the rate of recovery in the river below the dam. (See also W74-05181) (Houser-ORNL)
W74-05212

INFLUENCE OF WATER INTAKE ON THE DEGREE OF INCISOR FLUOROSIS AND ON THE INCORPORATION OF FLUORIDE INTO BONES AND INCISOR TEETH OF MICE,
Institute of Dental Research, Prague (Czechoslovakia).
J. A. Ruzicka, L. Mrklas, and K. Rokytova.
Caries Res. Vol 7, No 2, p 166-172, 1973. Illus.
Identifiers: Bones, *Caries, *Fluoride, *Fluorosis(Incisor), *Mice, Teeth, Tibial, Potable water.

Mice were given sodium fluoride solutions to drink in various concentrations and in various daily doses for a period of 200 days. At the end of experiment, both the fluoride content and the degree of fluorosis of the incisor teeth depended only on the concentration of fluoride in the administered solutions. The total daily fluoride intake was without effect. Both fluoride concentration in the drinking water and the total daily intake of fluoride produced effects in the tibia even after 220 days of experiment. This was caused by a great proportion of the bone which was not available to fluoride exchange while the unavailable bone conserved the state existing earlier. The importance of these results for dental caries prevention is discussed. The administration of fluoride in the form of fluoridated drinking water appears to be most advantageous.--Copyright 1973, Biological Abstracts, Inc.
W74-05246

ORGANOMERCURIALS IN THE ENVIRONMENT,
Glasgow Univ. (Scotland). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W74-05248

PCB RESIDUES IN PLANKTON FROM THE GULF OF ST. LAWRENCE,
Bedford Inst., Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 5A.
W74-05256

ISOLATION AND CHEMICAL IDENTIFICATION OF TOXIC COMPONENTS OF KRAFT MILL WASTES,
Fisheries Research Board of Canada, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5A.
W74-05270

FOREST PRODUCTS POLLUTION CONTROL -- ANNOTATED BIBLIOGRAPHY (EXCLUDING PULP AND PAPER),
Western Forest Products Lab., Vancouver (British Columbia).
For primary bibliographic entry see Field 5B.
W74-05284

THE ULTRASTRUCTURE OF AN ALLOPARASITIC RED ALGA CHOREOCOLAX POLYSIPHONIAE,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
P. Kugrens, and J. A. West.
Phycologia, Vol 12, Nos 3/4, p 175-186, December 1973. 12 fig, 19 ref.

Descriptors: *Rhodophyta, *Parasitism.
Identifiers: *Ultrastructure, *Choreocolax polysiphoniae.

An alloparasite, Choreocolax polysiphoniae, apparently represents one of the most evolved parasitic red algae. Chloroplasts are highly reduced and consist of double membrane limited organelles lacking any internal thylakoid development. The uninucleate cells have thick walls, an absence of starch in cortical cells and large quantities of starch in medullary cells. Host-parasite concentrations are made by typical red algal pit connections. General effects of the infection on the host include cell hypertrophy, decrease in floridean starch granules, dispersed cytoplasmic matrices, and contorsion of chloroplasts. (Little-Battelle)
W74-05299

RESEARCH ON RED ALGAL PIGMENTS. 5. THE EFFECT OF THE INTENSITY OF WHITE AND GREEN LIGHT ON THE RATE OF PHOTOSYNTHESIS AND ITS RELATIONSHIP TO PIGMENT COMPONENTS IN GRACILARIA COMPRESSA (C. AG.) GREV. (RHODOPHYCEAE, GIGARTINALES),
Bari Univ. (Italy). Inst. of Botany.
G. Calabrese, and G. P. Felicini.
Phycologia, Vol 12, Nos 3/4, p 195-199, December 1973. 1 fig, 2 tab, 22 ref.

Descriptors: *Rhodophyta, *Plant pigments, *Photosynthesis, *Light intensity, Chlorophyll, Respiration, Bioassay.
Identifiers: Gracilaria compressa, Green light, White light, Sunlight, Phycoerythrin, Carotenoids, Adriatic Sea, Sample preparation, Chlorophyll a, Carotene, Zeaxanthin, Lutein, Biliprotein.

The effects of green and white light at different intensities upon photosynthetic rates of Gracilaria compressa and their relationships to different pigment contents are reported. This is a typical rhodophycean alga, with adaptation to light intensity in the fronds of individual plants. In fact, the green distal portion which is exposed to direct sunlight (within a depth of a few meters), lacks phycoerythrin and shows a great proportion of carotenoids. The red proximal portion, which receives less light as a result of self-shading,

synthesizes phycoerythrin and more chlorophyll. The photosynthetic activity in the two portions, assayed under different light conditions, indicates that the abundant oxygen output in the basal red part of the thallus, also at low light intensity, may be due to a high content of photosynthetic pigments. Conversely, the absence of phycoerythrin and lower chlorophyll content in the distal yellow-green part permits a reasonable photosynthetic rate only at higher light intensity. This is especially apparent in green light: at 250 lux no photosynthetic activity is to be seen in the yellow-green thallus, while the red portion reaches the compensation point. (Mortland-Battelle)
W74-05300

POLYCHLORINATED BIPHENYLS IN THE SEASTAR ACANTHASTER PLANCI,
Walla Walla Coll., College Place, Wash. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W74-05301

CONTRIBUTION TO THE GENERAL PATHOLOGY OF ENDOCARDIAL REACTIONS: TOXIC ENDOCARDIAL LESIONS IN LOWER VERTEBRATES (CARP), (IN GERMAN),
Bundesgesundheitsamt, Berlin (West Germany). Max von Pettenkofer Institut.
D. Schulz.
Virchows Arch Abt A Pathol Anat. Vol 358, No 3, p 273-280, 1972, Illus. (English summary).
Identifiers: Bacteria, Cardial, *Carp, *Endocardial reactions, Exposure, Granuloma, Lesions, Vertebrates, *Toxicity, *Herbicides(Karmex) Fish pathology.

When carp were exposed to the herbicide Karmex (active ingradient 80% diuron) in laboratory conditions or in a pond they showed changes in the endothelial cells of the cardiac valves with concentrations of 0.1 ppm diuron or more. The endocardial changes ranged from slight to marked with numerous granulomas. The severity of histopathological findings depended on the concentration and time of exposure.--Copyright 1973, Biological Abstracts, Inc.
W74-05308

SPATIAL VARIABILITY OF THE PRODUCTIVITY: BIOMASS RATIO FOR PHYTOPLANKTON IN A SMALL MARINE BASIN,
Bedford Inst., Dartmouth (Nova Scotia).
T. Platt, and C. Filion.
Limnology and Oceanography, Vol 18, No 5, p 743-749, September 1973. 1 fig, 3 tab, 20 ref.

Descriptors: *Phytoplankton, *Primary productivity, *Biomass, *On-site tests, Habitats, Homogeneity, Variability, Spatial distribution, *Canada, Water sampling, Sea water, Chlorophyll, Radioactivity techniques, Incubation, Statistical methods, Light, Photosynthesis.
Identifiers: Contemporaneous disequillibrium, Sample preparation, Dark bottle tests, Analysis of variance, Light bottle tests, Data interpretation, Errors, *Bedford basin(N.S.).

The productivity:biomass (P:B) ratio for phytoplankton was studied using a replicated sampling design at six stations in a small marine basin. On six out of ten sampling days, statistically significant differences were revealed in the P:B ratios between stations. This result is consistent with the concept of contemporaneous disequilibrium which emphasizes the spatial component of the heterogeneity of the phytoplankton habitat. The measurements were made in the Bedford Basin, Nova Scotia. Six sampling stations were used. On each of 10 sampling days, each station was visited and 15 liters of seawater collected from 5-m depth. The water from each station was stored in a separate carboy. When water had been gathered from all six stations, each carboy was shaken thoroughly and the following samples drawn off: six replicate 1-liter samples for chlorophyll analysis; six replicate light bottles and four replicate dark bottles for C-14-uptake measurement. All of the replicates for C-14-uptake measurement, a total of 60, were incubated at station 1 at 5-m depth. The in situ incubation of the C-14-uptake experiments lasted 4 hr. Chlorophyll was used as an index of phytoplankton biomass. An analysis of variance design permitted calculation of the standard errors of chlorophyll and C-14 uptake in the light and dark. Using these, the standard errors of the P:B ratios were calculated and compared between stations on the same day. (Mortland-Battelle)
W74-05316

BREEDING AND GROWTH OF THE CHAETOGNATH SAGITTA ELEGANS IN BEDFORD BASIN,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
A. Zo.
Limnology and Oceanography, Vol 18, No 5, p 750-756, September 1973. 5 fig, 2 tab, 20 ref.

Descriptors: *Breeding, *Growth rates, Worms, Sea water, Water sampling, Water temperature, *Canada, Reproduction, Secondary productivity, Respiration, Life cycles.
Identifiers: *Sagitta elegans, Chaetognaths, Sample preservation, Bedford Basin(N.S.), Macroinvertebrates.

This work was an attempt to examine a complete cycle of breeding and growth of Sagitta elegans Verrill, the only chaetognath found in Bedford Basin. Bedford Basin is an oval-shaped depression about 7 km long and 4 km wide with a maximum depth of 70 m. It is connected to the coastal water of Nova Scotia through a southeastern channel. A collection was taken every 2 weeks during daylight hours from 6 November 1967 to 21 February 1969 at a single station in the deepest part of Bedford Basin (depth 68 m, tidal range plus or minus 2 m). Samples were preserved immediately in an 8 percent Formalin-seawater solution. In the laboratory, counting, measuring, and stage separation were carried out under the microscope, usually on the day following collection. Within 1 year two generations of Sagitta elegans were found. The spring generation, reaching maturity of mid-September, reproduced during the remainder of the year. The autumn generation, consisting of the offspring of the spring generation, appeared to overwinter and established the spring adult population. The temperature-size relationship of S. elegans from Bedford Basin is in close agreement with McLaren's curve for this species in the eastern Canadian Arctic. Net carbon production rate, calculated from the spring generation, was highest in mid-September when the majority of the population approached maturity. (Mortland-Battelle)
W74-05317

DAPHNIA DISTRIBUTION WITHIN LANGMUIR CIRCULATIONS,
Freshwater Biological Association, Windermere (England).
D. G. George, and R. W. Edwards.
Limnology and Oceanography, Vol 18, No 5, p 798-800, September 1973. 2 fig, 9 ref.

Descriptors: *Daphnia, *Distribution patterns, Light intensity, Winds, Reservoirs, Sampling, *Eutrophication, Water pollution effects.
Identifiers: *Langmuir circulations, Daphnia hyalina, Foamlines, Macroinvertebrates, Vertical distribution.

Crustacean zooplankton distribution was studied in Eglwys Nynydd, a eutrophic reservoir near Port Talbot, S. Wales. The reservoir is exposed to the prevailing winds blowing in from the sea and never stratifies thermally. Daphnia hyalina var. lacustris (Sars) dominates the zooplankton, both numerically and in terms of biomass, throughout the year. Studies of the vertical distribution of the species collected over 2 years have shown that the animals tend to avoid the surface waters in daylight. Continuous horizontal samples of zooplankton were taken with a self-priming pump (30 liters/min capacity) connected to a sectional intake boom installed on a small boat. When used to examine distributions within Langmuir spirals the intake boom was positioned just below the surface (10-30 cm) and run first along, and then midway between, well-defined foamlines. Water was pumped directly into 2-liter containers in the boat for subsequent filtration on shore and all the Daphnia in each sample were counted. Daphnia hyalina was concentrated near the surface midway between the foamlines of Langmuir circulations that developed in a shallow reservoir at wind speeds above 400 cm/sec. Such concentration was probably caused by the antagonistic factors of upward water transport carrying D. hyalina to the surface zone and oriented movements away from this region of high light intensity. (Mortland-Battelle)
W74-05318

MICROCULTURES OF BROWN BULLHEAD (ICTALURUS NEBULOSUS) CELLS: THEIR USE IN QUANTITATION OF CHANNEL CATFISH (ICTALURUS PUNCTATUS) VIRUS AND ANTIBODY,
Georgia Univ., Athens. Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 5A.
W74-05323

EFFECTS OF RED MUD ON MARINE ANIMALS,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
R. A. A. Blackman, and K. W. Wilson.
Marine Pollution Bulletin, Vol 4, No 11, p 169-171, November 1973. 1 tab, 7 ref.

Descriptors: *Toxicity, *Waste disposal, *Marine fish, *Clams, *Shrimp, *Oysters, Bioassay, Water pollution effects, Industrial wastes, Mortality.
Identifiers: *Red mud, Scrobicularia plana, Cardium edule, Solea solea, Mytilus edulis, Crangon crangon, Agonus cataphractus, Germany, United Kingdom, North Sea, Bristol Channel.

Red mud, which is a waste product from the reduction of bauxite in the production of aluminum, has been disposed of in Bristol Channel by the UK with no apparent harmful effects. However, in considering the North Sea as a potential dump for red mud, Germany concluded that such disposal would be inadvisable because of detrimental effects on fauna. To determine whether the difference in results occurred from differences in chemical or physical characteristics of the red muds, bioassays were conducted with red muds from the UK and Germany. Red muds contain various quantities of Fe_2O_3, Al_2O_3, SiO_2, Na_2O, CaO, TiO_2, and ash. The experimental solutions were prepared from settled solids; the UK material had about 26 percent solids and the German 55 percent. The experiments were of two types: exposure to red mud settled on a substrate or red mud maintained in suspension. Scrobicularia plana, a deposit-feeding bivalve, Cardium edule, a suspension-feeding bivalve, and Solea solea, a bottom-living flatfish, were exposed to the deposits (5.0-50 mg/sq cm). Mytilus edulis, Crangon crangon (brown shrimp), and Agonus cataphractus (armed bullhead) were exposed to the suspension (up to 33 g/l). All organisms seemed to be unaffected by red mud except the armed bullhead. At 33 g/l, all bullheads died within 72 hr. No mortality occurred in 72 hr with 3.3 g/l red mud. On the evidence of the comparative studies it is concluded that the differences in origin and treatment of bauxite result in red muds of only slightly different toxicities. The physical and

chemical characteristics of the waste and its observed effects on plants and animals in the laboratory are important considerations, but they must be related to the hydrographic and biotic features of the proposed disposal site, to the quantities involved and to the method of disposal. (Little-Battelle)
W74-05325

PARAFFIN HYDROCARBON PATTERNS IN PETROLEUM-POLLUTED MUSSELS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 5A.
W74-05326

STUDY OF METABOLIC REGULATIONS BETWEEN CYANOPHYCEAE AND FISH (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
A. Ya. Malyarevskaya, T. I. Birger, O. M. Arsan, and V. D. Solomatina.
Gidrobiol Zh, Vol 8, No 3, p 47-55, 1972, Illus, English summary.
Identifiers: *Cyanophyceae, *Fish metabolism, Microcystis-aeruginosa, Nitrogen, Oxygen, *Toxicity, Hydrochemical regime.

The problems of the effect of Cyanophyceae (Microcystis aeruginosa) on fish were studied. Changes in the hydrochemical regime in the fish environment under effect of Cyanophyceae, changes in the O2 consumption intensity, N metabolism, biochemical composition of fish under different Cyanophyceae concentrations in environment are shown. Some mechanisms of the toxic effect on fish are detected.--Copyright 1973, Biological Abstracts, Inc.
W74-05327

PHILOMETRA NODULOSA IN WYOMING WHITE SUCKERS,
Wyoming Game and Fish Commission, Casper.
T. J. Clifford, and S. Facciani.
Prog Fish-Cult, Vol 34, No 4, p 235-236, 1972, Illus.
Identifiers: *Copepod, Philometra-nodulosa, *White suckers, *Wyoming(Ocean Lake), *Water temperature, *Nematodes.

A severe infection by the nematode P. nodulosa was observed in the fins of the white sucker population of Ocean Lake, Wyoming. Information on the infection rate, migration date, and midlake water temperature was collected. Water temperature appeared to be the principal factor governing migration of the female nematode from the fins of the fish. Only the female P. nodulosa is infective in the fins, 'cheek galleries,' and gular areas of fish and subsequently migrates from the fishes body to release larvae from its enlarged uterus. The larvae are ingested by copepods which are in turn ingested by fish where they become reinfective as adults.--Copyright 1973, Biological Abstracts, Inc.
W74-05329

RESEARCH TO DETERMINE THE ENVIRONMENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES--FIRST ANNUAL PROGRESS REPORT,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. L. Windom, and R. R. Stickney.
Available from NTIS, Springfield, Va 22151 AD-757 717 Price $6.00 printed copy; $1.45 microfiche.
Contract Report, April 1972. 373 p, 141 fig, 60 tab, 16 ref. Army Corps of Engineers Contract DACW 21-71-0020.

Descriptors: *Dredging, *Environmental effects, *Salt marshes, Wetlands, Spoil banks, Water pollution effects, Silting.

The environmental response to the deposition of dredged material on salt marshes was studied in diked and undiked confinements. Studies of water quality changes, studies of salt marsh sediment responses, and biological studies were directed toward identifying any changes in the biota in areas of dredging activities. In natural and relatively unpolluted areas, dredging has no significant effect on water quality where diked or undiked techniques are used. In polluted areas in marine environments, water quality impairment is caused by dredging activities. The time that the water with the dredge material is allowed to stay in the spoil area may greatly influence the quality of the effluent from the spoil area. The depth of spoil material deposited on the salt marshes will greatly affect the time of reequilibration of the salt marsh vegetation to its original configuration. No effects of dredging on the fishes and macroinvertebrate fauna within the 1971 dredged areas along the Intracoastal Waterway of Georgia could be defined. Seasonal patterns between experimental and control stations showed no deviations outside of apparent normal ones. In addition, samples obtained immediately prior to, during, and after dredging showed no patterns which could specifically be assigned to effects of dredging. (Knapp-USGS)
W74-05332

MEASURING IMPACTS OF WATER RESOURCE DEVELOPMENTS ON THE HUMAN ENVIRONMENT,
Battelle-Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 6G.
W74-05338

IN VITRO INTERACTIONS OF FUSARIUM AND VERTICILLIUM WILT FUNGI WITH WATER, PH AND TEMPERATURE,
For primary bibliographic entry see Field 3F.
W74-05341

THE NONPARASITIC DISEASES. IMMISSION DAMAGE (GAS, SMOKE AND DUST DAMAGE). WASTE WATER DAMAGE INCLUDING DAMAGE CAUSED BY SOLID WASTES,.
Paul Parey: Berlin, West Germany. 1970. 227 p. Illus.
Identifiers: Books, Dust, Fluorides, Gas, *Immission damage, Lime, Metals, Nitrates, Nitrites, Nonparastic diseases, Smog, Smoke, Solid wastes, *Air pollution effects, *Water pollution effects, *Bibliographies.

Aspects of protection for a wide range of plants, especially cultivated plants, against immissions are discussed. Immissions include SO2, fluoride compounds, ammonia, H2S, nitrous gases, H2SO4, chromic acid, smog and peroxyacetyl nitrate, nitrite, lime, alkali, basalt, metal, arsenic and grain dusts, and ashes. The damage to the plants, their mode of effect, plant resistance and determination of these immissions in the atmosphere are discussed. The effect of waste water and solid wastes on plants and soil, the fertilizer value of some household and industrial wastewater and damage caused by alkali salts, trace elements, organic substances, detergents, radioisotopes, compost, sewage sludge, mineral oil products and solid industrial wastes are also discussed. An extensive bibliography is included at the end of each section.--Copyright 1973, Biological Abstracts, Inc.
W74-05342

BIONOMICS OF CYCLOPS STRENUUS ABYSSORM SARS (COPEPODA:CYCLOPOIDA),
Freshwater Biological Association, Ambleside (England).
W. J. P. Smyly.
Oecologia (Berl). Vol 11, No 2, p 163-186. 1973. Illus.
Identifiers: Biomass, *Bionomics, *Copepoda, Cyclopoida, Cyclops-Strenuus-Abyssorum, Dissolved oxygen, Fecundity, Lakes, Production, Sewage, Water pollution effects, *English Lake District.

The annual cycle of C. strenuus abyssorum in some lakes of the English Lake District is described. Esthwaite Water, Rydal Water and Grasmere, all enriched by sewage, and Buttermere, a relatively unproductive lake, were sampled most frequently. There is only 1 effective generation in the year in each of these lakes. Individuals hatch from eggs laid in the spring. In the deepest of the 4 lakes (Buttermere), these individuals reach the adult stage in early winter, pass the winter in the planktonic zone and start laying eggs early in the following year. In the other 3 lakes, most individuals of the spring generation reach the 5th copepodid stage by mid-summer and then spend the next 8 mo. in the profundal zone. They leave this zone in Feb. or March to return to the planktonic zone, become adult and start breeding. In July a few individuals may mature in the planktonic zone. A correlation between the time in mid-summer when stage V copepodids appear in the profundal zone of the 3 shallower lakes and amounts of dissolved O2 in this zone is shown. Although a correlation of this kind is plausible, presence of stage V copepodids in a deep, well oxygenated lake (Tirlmere) suggests that a casual connection of this kind is too simple an explanation. Rates of development of the different instars were experimentally at constant temperatures and used to estimate production. Production, biomass and fecundity were all higher in Esthwaite Water than in the other 3 lakes.--Copyright 1973, Biological Abstracts, Inc.
W74-05344

EFFECT OF TRACE ELEMENTS ON THE WATER REGIMEN, THE DECORATIVE QUALITIES AND THE SEED YIELD OF SOME ORNAMENTAL PLANTS, (IN RUSSIAN),
Kishinev Botanical Garden (USSR).
K. I. Andon.
Agrokhimiya. 3, p 107-111. 1972.
Identifiers: *Boron, Decorative qualities, *Manganese, Ornamental plants, *Petunia plants, Seeds, *Trace elements, Yield, *Zinc.

Supplemental, foliar application of B, Mn and Zn improves the water regimen and increases the ornamental quality, seed production and fragrance of hybrid petunia plants.--Copyright 1973, Biological Abstracts, Inc.
W74-05345

LOW PH LEVELS WIPE OUT SALMON AND TROUT POPULATIONS IN SOUTHERNMOST NORWAY,
K. W. Jensen, and E. Snekvik.
Ambio, Vol 1, No 6, p 223-225, 1972, Illus.
Identifiers: *Norway, Fish populations, *Salmon, *Trout, *Hydrogen ion concentration, Fish hatching, Fish mortality.

Low pH levels in rivers of southern Norway have resulted in the mortality of trout and salmon. Experiments show that the lower pH limits for normal hatching and fry development are pH 5.0-5.5 for salmon, 4.5-5.0 for sea trout and ca pH 4.5 for brown trout. An examination of the relation between pH values in the rivers and lakes in question and salmon and trout populations shows that these fish populations generally decrease in size as the pH level decreases.--Copyright 1973, Biological Abstracts, Inc.
W74-05356

PRELIMINARY LABORATORY TESTS FOR THE CONTROL OF ALGAE IN RICE FIELDS (IN ITALIAN),
Milan Univ. (Italy). Istituto di Patologia Vegetale.
M. Bisiach.

Riv Patol Veg, Vol 8, No 2, p 159-181, 1972, Illus, English summary.
Identifiers: *Algae control, *Algicides, Benzuride, Captafol, Chloroacetamido-3, Folpet, Hydrodictyon-reticulatum, Laboratory tests, *Naphtho quinone derivatives, Oedogonium, Potassium permanganate, *Rice fields, Spirogyra, Tests.

Benzuride, Captafol, HOE 2997, Folpet and KMnO4 at 0.5, 1, 2, 4 and 8 ppm were tested against Spirogyra sp., Oedogonium sp. and Hydrodictyon reticulatum. Rice seedlings are often killed by suffocation caused by algal scum. All the chemicals except Benzuride showed marked algicidal activity. HOE 2997 (2,dichloroacetamido-3,chloro,1,4naphthoquinone) has a complete algicidal activity at 1 ppm against Oedogonium sp. and H. reticulatum and at 2-4 ppm against Spirogyra. The naphthoquinone derivative was not phytotoxic for rice, and is recommended for the control of algae in rice fields.--Copyright 1973, Biological Abstracts, Inc.
W74-05357

DISTRIBUTION AND EPIZOOTIOLOGICAL IMPORTANCE OF DACTYLOGYRUS EXTENSUS (MONOGENOIDEA) IN SLOVAKIA (IN CZECH),
R. Zitnan.
Helminthologia (Bratisl). 11. p 141-146, 1970, English summary.
Identifiers: *Carp, *Czechoslovakia(Slovakia), *Dactylogyrus-extensus, Distribution, Epizootiological studies, *Monogenoidea.

Carps (1350) were examined in Slovakia (CSSR) in 54 localities of different water types during 1957-1969. D. extensus was found in all localities, its total distribution rate being 82.9% with a frequency rate of 1-246 specimens. The importance of D. extensus in early spring at a water temperature below 10C when young carp may be seriously endangered in hibernation ponds is indicated.--Copyright 1973, Biological Abstracts, Inc.
W74-05358

ON THE PROBLEM OF HOST SPECIFICITY, RESERVOIR PARASITISM AND SECONDARY INVASIONS OF CAMALLANUS LACUSTRIS (NEMATODA:CAMALLANIDAE), (IN CZECH),
Ceskoslovenska Akademie Ved, Prague. Parazitologicky Ustav.
F. Moravec.
Helminthologia (Bratisl). 10. p 107-114, 1969(1971), Illus.
Identifiers: Camallanidae, *Camallanus-lacustris, *Cyprinid, *Fish parasites, Host specificity, *Nematoda, *Perch, Reservoirs, *Salmonoid.

C. lacustris parasitizes mainly perch but can often be found in representatives of other families, e.g. Cyprinid and salmonoid fishes. Secondary invasions by adult parasitic worms from the original host to a new host fish are possible. The possibility of an atypical location of C. lacustris larvae in the host was investigated and no larvae were found in atypical locations.--Copyright 1973, Biological Abstracts, Inc.
W74-05359

COMPARATIVE STUDY OF THE EFFECT OF SOME ANION ACTIVE DETERGENTS ON THE REPRODUCTION OF LISTERIA MONOCYTOGENES AND OTHER BACTERIA,
J. Durst, J. Palicska, and A. Sawinsky.
Z Gesamte Hyg Grenzgeb, Vol 18, No 8, p 618-621, 1972, Illus.
Identifiers: Bacteria, *Bactericidal agents, *Detergents(Anion active), Escherichia-coli, *Listeria-monocytogenes, Pseudomonas-aeruginosa, Reproduction, Waste water.

The effects of Na dodecyl benzenesulfonate (DBS) and Na lauryl sulfate (LS) in concentrations up to 10000 microgram/ml on growth of L. monocytogenes, Pseudomonas aeruginosa and Escherichia coli cultures showed that at the doses used, both detergents had a bactericidal effect on L. monocytogenes. P. aeruginosa and E. coli were much less sensitive to the detergents. The intensity of the effect of the detergents was dependent on the substances in which they were dissolved; the bactericidal effect of DBS was higher in water and NaCl and the effect of LS was higher in meat broth boullion. Since only very high detergent concentrations have very high bactericidal effects in waste water, L. monocytogenes could occur in these waters. The occurrence of L. monocytogenes in surface waters is less probable, since lower detergent concentrations have a bactericidal effect.--Copyright 1973, Biological Abstracts, Inc.
W74-05360

TOXICITY OF SOD PODZOLIC SOILS LYSIMETRIC SOLUTIONS, (IN RUSSIAN),
For primary bibliographic entry see Field 2G.
W74-05375

WATER QUALITY MODELS AND AQUATIC ECOSYSTEMS STATUS, PROBLEMS AND PERSPECTIVES,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5B.
W74-05393

5D. Waste Treatment Processes

REMOVAL OF HEAVY METALS FROM MINE DRAINAGE BY PRECIPITATION,
Denver Univ., Colo. Dept. of Chemical Engineering and Metallurgy.
L. W. Ross.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-080, $1.00; microfiche from NTIS as PB-228 584 $1.45. Environmental Protection Agency Technology Series report EPA-670/2-73-080, September 1973. 64 p, 22 fig, 1 tab, 14 ref. EPA Project 14040 FZC.

Descriptors: *Mine drainage, Metals, Sulfides, *Neutralization, *Heavy metals, Chemical precipitation, *Waste water treatment, Colorado, Rocky mountain region, Computer programs, *Recycling, Costs, *Mine wastes.
Identifiers: San Juan Mountains, *Sulfide treatment, *Recovery(Mine wastes).

Heavy metals in mine drainage waters of the Rocky Mountains can be removed by a two-stage process consisting of (1) neutralization followed by (2) sulfide treatment. The first stage removes ferric and aluminum hydroxides, and the second (sulfide) stage precipitates the heavy metals that are most objectionable as pollutants, and that are of possible interest for economic recovery. The two-stage process has been demonstrated in the laboratory and in a field experiment. In the field, powdered lime was employed for neutralization, and barium sulfide was employed as sulfide source in a two-stage treatment tank. The ferric and aluminum hydroxides failed to settle when the slightest winds disturbed the surface of the settling pond, but the sulfides settled within a few feet downstream. The measured pH of treated streams has proven entirely satisfactory for control of chemical additions. A computer program based on published values of equilibrium constants and solubility-product constants is capable of adequate prediction of the required chemical quantities for treatment, and of the resulting metal concentrations in solution. The economics of chemical addition indicates that recovery of sulfides (CuS, ZnS) for sale to smelters can partially offset the cost of treatment, but never completely. (EPA)
W74-04851

DYNAMIC BEHAVIOR OF A COMPLETE-MIXING ACTIVATED SLUDGE SYSTEM,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
G. C. Y. Chu, L. E. Erickson, and L. T. Fan.
Biotechnology and Bioengineering, Vol 15, p 1101-1121, November 1973. 13 fig, 2 tab, 23 ref.

Descriptors: *Activated sludge, *Biological treatment, *Waste water treatment, Flow rates, Chemical oxygen demand, *Aeration, Organic matter, Cultures, Gravimetric analysis, Recycling, *Sludge treatment.
Identifiers: Wasting rates, Continuous cultures, Adenosine triphosphate, Dry weight.

The dynamic behavior of a laboratory-scale activated sludge biological waste treatment process with recycle and wasting of sludge was investigated by subjecting the system to step changes in the influent waste concentration, the recycle flow rate, or the sludge wasting rate. The dynamic behavior of the system was examined by measuring adenosine triphosphate (ATP) in addition to dissolved chemical oxygen demand (COD) and cell dry weight in the aeration tank. Cell dry weight of the recycle flow and effluent COD were also measured. System performance changed appreciably when the system was subjected to step changes in the influent waste concentration, the recycle flow rate, or the sludge wasting rate. Generally, the responses to a step increase and a step decrease of the same input variable were not symmetrical, especially in the response of the ATP concentration. The ATP/MLSS ratio was found to depend on the food-to-organism ratio in the aeration tank. When this ratio was small, the ATP/MLSS was large. The time constant analysis showed that the dry weight time constants were directly related to the sludge mean residence time; as the sludge wasting rate increased, the value of the time constant decreased. The time constants of the dissolved COD variation in the aeration tank were much smaller than those of the sludge dynamics. The dissolved COD time constants were found to be closely related to the fluid mean residence time in the aeration tank. (Mortland-Battelle)
W74-04900

POPULATION CHANGES IN ENTERIC BACTERIA AND OTHER MICROORGANISMS DURING AEROBIC THERMOPHILIC WINDROW COMPOSTING,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Biochemistry and Microbiology.
J. Savage, T. Chase, Jr., and J. D. Macmillan.
Applied Microbiology, Vol 26, No 6, p 969-974, December 1973. 9 fig, 2 tab, 13 ref.

Descriptors: *Enteric bacteria, *Farm wastes, *Hogs, *Aerobic conditions, Waste treatment, Temperature, Hydrogen ion concentration, Oxidation-reduction potential, Environmental effects, Salmonella, Temperature, Sampling, Methodology, Decomposing organic matter.
Identifiers: Survival, *Composting(Windrow), Bacterial populations, *Thermophilic conditions, Fecal streptococci, Cellulolytic microorganisms, Fecal coliforms, Mesophilic microorganisms, Enterococci, Actinomycetes, Culture media, Selective media, Biochemical tests, Mesophilic bacteria, Mesophilic fungi.

Composting of wastes from swine feeding operations was studied. The effects of the frequency of turning the wastes and addition of straw to improve the physical structure was studied to determine the most effective technique to rapidly increase the temperature and, consequently, destroy coliforms and Salmonella. Four different treatments were studied; the results showed that, with addition of 5 percent (wt-wt) straw and mechanical turning of the compost 20 times per week, the temperature reached 60C within 3 days and enteric bacteria were destroyed within 14 days. The possibility of survival of pathogens at the cool surface

of a windrow operation, however, has not been disproven. The results indicate a marked decrease in coliforms, salmonellae, and enterococci during the thermophilic stage of composting. For maximal sanitary safety, the thermophilic stage of composting should be reached as soon as possible. A succession of microbial populations was observed during the composting process. The bacteria increased in number before the temperature of the windrows rose and then declined, whereas cellulolytic organisms and actinomycetes in general increased in the thermophilic stage. Presumably, the mesophilic bacteria rapidly attack the more readily available organic constituents, resulting in a temperature increase. The increased temperature favors the cellulolytic organisms, and the mesophilic bacteria largely disappear. The actinomycetes appeared in the final stage to such an extent that the surfaces of the compost piles were white or gray. These organisms are known to play a role in the humification of organic matter, which results in a stabilized product. (Holoman-Battelle)
W74-04908

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
E. J. Ciolkosz, L. T. Kardos, and W. F. Beers, Jr.
Available from the National Technical Information Service as PB-228 868, $10.25 in paper copy, $1.45 in microfiche. Pennsylvania State University Institute for Research on Land and Water Resources, Technical Completion Report, December 1973. 135 p, 24 fig, 30 tab, 38 ref, 1 append. OWRR A-027-PA(1). 14-31-0001-4038.

Descriptors: *Acid Mine Water, Percolation, Acidity, *Iron, *Conductivity, *Soil properties, Silt loam, Clay loam, Cation exchange, Water quality, Calcium carbonate, *Pennsylvania, *Hydrogen ion concentration, *Waste water treatment, Water pollution control.
Identifiers: Rayne silt loam, Guernsey silty clay loam, Soil pH, Renovation, Equilibration.

Equilibration of soil material from three horizons (Ap, B23 and Cl) at various ratios (1:1, 1:5 and 1:50) of soil to acid mine drainage water (AMW) indicated that maximum effect on pH, total acidity, conductivity, and iron content of the AMW occurred within five minutes and in the narrowest soil:AMW ratio. At 32 hours pH was increased from 3.1 to 6.6 with the Ap horizon material in the 1:1 ratio. The more acidic B23 and Cl horizons increased the pH one unit. Total acidity decreased 85%, 65% and 45% with the Ap, B23 and Cl materials, respectively. Conductivity decreased about 5 to 10%. Total iron content in the 1:1 system was decreased from 250-330 mg/l to a trace with all three soil materials. Percolation of AMW through reconstructed 40-inch soil profiles of Rayne silt loam and Guernsey silty clay loam at a loading rate of 5 inches at weekly intervals for 20 weeks increased pH of the AMW from 2.6-2.8 to 4.0 with the Rayne soil and to 8.0 with the calcareous Guernsey soil. Total acidity was decreased 75% with the Rayne soil while the Guernsey soil produced an alkaline column effluent. Iron was totally removed by both soils. Al was decreased 50% by the Rayne soil. The Guernsey soil totally removed Al, Zn, Cu, and Mn. Conductivity was decreased 16% by the Rayne and 11% by the Guernsey. Twenty-one soil samples (horizons) from seven Pennsylvania soils were equilibrated for 32 hours three times in succession in a 1:5 soil:AMW ratio. Multiple linear regression analysis was used to evaluate the effect of certain soil properties on the chemical quality of the equilibrated AMW. Most of the variation of pH, total acidity and iron was accounted for by cation exchange capacity and $CaCO_3$ equivalent.
W74-04981

ECOLOGY OF DAPHNIA IN STABILIZATION PONDS,
Texas State Dept. of Health, Austin. Div. of Wastewater Technology and Surveillance.
R. Dinges.
Report 1973. 41 fig, 14 tab, 69 ref, appendix.

Descriptors: *Waste water treatment, *Daphnia, *Oxydation lagoons, *Biological treatment, Texas, Photoperiodism, Life cycles, Ammonia, Toxicity, Sulfides, Hydrogen ion concentration, Depth, Marketing, Design, Water quality, Bibliographies, Effluents, Crustaceans, Water purification, Algae, Rotifers, Dissolved oxygen, Hatching, Predation, Pilot plants.
Identifiers: *Daphnia similis, Daphnia pulex, Moina, Lemna.

It was observed that the presence of Daphnia resulted in clarified wastewater stabilization pond effluent in a few (6%) Texas locations. This investigation focused on the suitable environmental conditions for Daphnia and Moina. The two Daphnia species, D. similis and D. pulex, were only present in extra deep ponds. The manner in which Daphnia serves to stabilize and clarify water could include digestion processes, by incorporation of organics into biomass, and some material is rendered inert by conversion into chitin, the material of which Daphnia shells are composed. A limited market for Daphnia exists, but would quickly be satisfied should mass culture in wastewater prove feasible and offers a real possibility of gaining significant financial returns from a wastewater resource. A pilot plant operation indicated that successful operation required provision of adequate mixing-aeration to supply the respiratory needs and associated organisms and to preclude evolution of soluble sulfides from benthic deposits and to control pH within a range of 7.0 - 7.5. Daphnia culture (which is described) may be feasible to further improve effluents from secondary wastewater treatment plants due to its feeding habits on algae and other suspended organic material. Its life cycle and a pertinent literature review are included. (Auen-Wisconsin)
W74-05048

AIR FLOTATION-BIOLOGICAL OXIDATION OF SYNTHETIC RUBBER AND LATEX WASTE-WATER,
Firestone Synthetic Rubber and Latex Co., Lake Charles, La.
A. H. King, J. Ogea, and J. W. Sutton.
Copy available from GPO Sup Doc as EP1.23:660/2-73-018; $1.60; microfiche from NTIS as PB-229 408 $1.45. Environmental Protection Agency, Technology Series Report, EPA-660/2-73-018, November 1973. 136 p, 21 fig, 20 tab, 14 ref. EPA Project 12110 GLP.

Descriptors: *Waste water treatment, Industrial wastes, Treatment facilities, *Synthetic rubber, *Louisiana, *Coagulation, Flocculation, *Flotation, *Biological treatment, Aerated lagoons, *Oxidation, Biochemical oxygen demand, Pilot plants, Construction costs, Operating costs, Design data.
Identifiers: Lake Charles(La).

The operation of a secondary waste-water treatment facility for treatment of the combined wastewater from Firestone's Lake Charles, Louisiana synthetic rubber manufacturing plant was studied for a period of nine months. The waste-water treatment facility was designed to treat an average daily flow of 3.4 mgd and a BOD load of approximately 2,000 lbs/day. The report describes the laboratory and pilot studies that were performed during the process development phase of the project and presents design data, operational data, and treatment cost data for the full scale facility. The effluent BOD concentration averaged 11.5 mg/l, with a suspended solids content of 29 mg/l. The BOD removal rate coefficient averaged .067 mg/l/day with an average BOD loading rate of .548 lbs BOD/day/lb MLSS. Capital costs including construction for the treatment facility were $1,472,528. Operational, maintenance, and depreciation costs were $.499/1,000 gals. of raw waste-water treated, excluding sludge disposal costs. (EPA)
W74-05105

INTERSTATE PLANNING FOR REGIONAL WATER SUPPLY AND POLLUTION CONTROL.
Weston (Roy F.), Inc., West Chester, Pa.
Copy available from GPO Sup Doc as EP1.16:16110FPP 11/71, $3.00; microfiche from NTIS as PB-229 573 $1.45. Water Pollution Control Research Series, Environmental Protection Agency, November 1971. 206 p. EPA Project 16110 FPP.

Descriptors: *Planning, *River Basin development, *Pollution abatement, Optimum development plans, *Regional analysis, *Interstate Commissions, *Water supply, Land use, *Alternative planning, Waste disposal, *Waste water treatment, Sewage treatment, Projections, Human population, Water demand.
Identifiers: Waste treatment regionalization, *Delaware River(Tock's Island region).

This report, prepared for Delaware River Basin Commission presents the results of a study of the problem of water supply and waste disposal in the three-State, six-county region in which the Tocks Island Reservoir and the Delaware Water Gap National Recreation Area are being developed. Peak summer populations are projected over a 50-year period and utilities systems alternatives which could accommodate such projected growth are presented. Water supplies in the region are seen as adequate to meet future demands, with heavy emphasis on development of groundwater resources. Five alternative sewerage plans, ranging in degree of regionalization from 116 local treatment systems to a single system for the entire region, are outlined including detailed cost estimates. Preservation of water quality in the region is a primary objective of the study. (EPA)
W74-05108

TREATMENT OF LAUNDROMAT WASTES,
Rensselaer Polytechnic Inst., Troy, N.Y.
D. B. Aulenbach, P. C. Town, and M. Chilson.
Copy available from GPO Sup Doc as EP1.23/2:73-108, $0.95; microfiche from NTIS as PB-227 369 $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-108, February 1973. 65 p, 18 fig, 20 tab, 10 ref. EPA Project 12120 DOD.

Descriptors: *Waste water treatment, *Recycling, *Filtration, *Ion exchange, Chemical precipitation, Effluents, Industrial wastes, Detergents, *Biochemical oxygen demand, *Chemical oxygen demand, *Alkylbenzene sulfonates.
Identifiers: Alum treatment.

Laboratory and field studies were conducted to evaluate the laundromat waste treatment capabilities and the effluent recycling possibilities of two systems. The Winfair Water Reclamation System (WWRS) involves the addition of alum at a pH of 4, sand filtration, and passage through an ion exchange resin. The American Laundry Machinery Industries (ALMI) Diatomaceous Earth Filtration System employs chemical precipitation prior to filtration. The WWRS resulted in a 61% BOD reduction, 71% COD reduction, 94% ABS reduction, and a buildup of total solids in the effluent. The system produced an effluent suitable for discharge into many streams. For effluent recycling, a functioning demineralizer would be required. The ALMI System achieved a 70% BOD reduction, 84% COD reduction, 98% ABS reduction, 94% PO4 reduction, and complete coliform removal. The increase in effluent alkalinity and hardness render very questionable the suitability of effluent reuse without softening and pH adjustment. The introduction of the system into existent

aundromats would increase the cost of washes by about 10 cents. (EPA)
W74-05109

KRAFT PULPING EFFLUENT TREATMENT AND REUSE - STATE OF THE ART,
Saint Regis Paper Co., Pensacola, Fla. Research and Development Center.
W. G. Timpe, E. Lang, and R. L. Miller.
Copy available from GPO Sup Doc as EP1.23/2:73-164, $1.25; microfiche from NTIS as PB-227 344 $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-164, February 1973. 95 p, 8 fig, 18 tab, 110 ref. EPA Project 12040EJU.

Descriptors: *Waste water treatment, Industrial wastes, *Pulp wastes, *Activated carbon, *Water reuse, *Reviews, Surveys, Recycling, Municipal water, Industrial water, Oxidation, *Tertiary treatment.
Identifiers: Collection systems, Solids removal, *Lime treatment.

A survey is presented of the literature and other sources on present practices and advanced methods of handling and treatment of pulp and paper mill effluents, with particular emphasis on the kraft process, and the use of activated carbon and lime treatment as advanced methods of treatment. The survey was made as a first step of a development program aimed at maximum water reuse in kraft pulp and paper mills based on effluent treatment using activated carbon. The results of the survey include information on activated carbon and its applications in treatment of pulp and paper mill effluents as well as in treatment of municipal water supplies and effluents. Information is presented on lime treatment of kraft mill effluent and on other advanced treatment methods. It also covers the subjects of in-plant water reuse, effluent collection systems, solids removal, and biological oxidation. (EPA)
W74-05110

COMBINED SEWER OVERFLOW FOR THE HUDSON RIVER CONFERENCE,
Interstate Sanitation Commission, New York.
A. I. Mytelka, L. P. Cagliostro, D. J. Deutsch, and C. A. Haupt.
Copy availabe from GPO Sup Doc as EP1.23/2:73-152, $2.85, microfiche from NTIS as PB-227 341, $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-152, January 1973. 287 p, 60 fig, 20 tab, 28 ref. EPA Contract 68-01-0055.

Descriptors: *Combined sewers, *Urban runoff, *Hudson River, *Interstate commission, Storm drains, *Sewers, Outfall sewers, *Treatment facilities, *Waste water treatment.
Identifiers: Solids removal, B.O.D. removal, Regulators.

A detailed examination was conducted of ten (10) combined sewer overflow systems within the portion of the Hudson River Basin lying within the Interstate Sanitation District. The work included the identification and study of these combined sewer systems in order to determine their location, physical characteristics, and service areas. The procedure employed included the physical examination of each system's regulators to determine their location, type, dimensions, and condition. A study of available records was made to determine, where possible, trunk line flow, interceptor line design capacity, and characterization of the drainage area served by each regulator which included population and land use. Ten (10) summary tables and forty (40) regulator location figures are included. Dry weather and wet weather sampling was also conducted. By-pass loadings for several pollution parameters have been calculated during storm flow conditions based upon this sampling. Recommendations for minimizing combined sewer overflows are included. (EPA)
W74-05112

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME I. COPPER, ZINC, AND LEAD INDUSTRIES,
Battelle Columbus Labs., Ohio.
J. B. Hallowell, J. F. Shea, G. R. Smithson, Jr., A. B. Tripler, and B. W. Gonser.
Copy available from GPO Sup Doc as EP1.23/2:73-247a, $1.90; microfiche from NTIS as PB-229 466, $1.45. Environmental Protection Agency, Technology Series Report EPA-R2-73-247a, September 1973. 168 p, 29 fig, 39 tab, 23 ref. EPA Project 12010 FPK. Contract 14-12-870.

Descriptors: *Metals, Water pollution control, Mining, *Industrial wastes, *Waste water treatment, Costs, *Copper, *Zinc, *Lead, Byproducts.
Identifiers: Nonferrous metals industry, Smelting, Refining.

The purpose was to identify specific research needs in the area of water pollution in the primary nonferrous metals industries. This program consisted of a survey of literature and the acquisition of data from industrial operations. The contents of the final reports (2 volumes) include: the identification of process steps using water and/or generating wastewater, the amounts of water used for various purposes, recirculation rates, amounts of wastewaters, specific or characteristic substances in wastewaters, the prevalence of wastewater treatment practice, methods, and costs; current treatment problems, and plans for future practices of recirculation or wastewater treatment. The metals reported on included copper, lead, zinc, and associated byproducts (arsenic, cadmium, silver, gold, selenium, tellurium, sulfuric acid, salts and compounds), mercury, (primary) gold and silver, aluminum, molybdenum, and tungsten. The information includes detailed processing descriptions and flowsheets, tabulations of quantities of water intake, quantities used by category, recirculated water, discharge water quantities and analyses, water treatment costs. Representative water flowsheets are given. (See also W74-05117) (EPA)
W74-05116

WATER-POLLUTION CONTROL IN THE PRIMARY NONFERROUS-METALS INDUSTRY -- VOLUME II. ALUMINUM, MERCURY, GOLD, SILVER, MOLYBDENUM, AND TUNGSTEN,
Battelle Columbus Labs., Ohio.
J. B. Hallowell, J. F. Shea, G. R. Smithson, Jr., A. B. Tripler, and B. W. Gonser.
Copy available from GPO Sup Doc as EP1.23/2:73-247b, $1.45; microfiche from NTIS as PB-229 467, $1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-247b, September 1973. 113 p, 16 fig, 30 tab, 31 ref. EPA Project 120/0 FPK. 14-12-870.

Descriptors: *Metals, *Industrial wastes, *Waste water treatment, *Aluminum, *Mercury, *Gold, *Molybdenum, Byproducts, Water pollution control, Mining.
Identifiers: Nonferrous metals, Industry, Smelting, Refining, *Silver, Tungsten.

The trend in the primary aluminum industry is toward reduced or zero discharge of waste water from both alumina refineries and aluminum smelters. The principal treatment needs of the aluminum industry relate to common types of industrial waste water such as cooling tower blow-down and neutralization products, and the specialized need to remove or recover fluoride ion components from fume scrubbers at smelters. The primary mercury industry, by virtue of a current air pollution control problems, may require increased measures of water pollution control associated with air emission control equipment or new processing methods. The primary molybdenum industry, consisting of a small number of operations other than those associated with the copper industry, has taken or is designing effective methods of water pollution control ranging from isolated water systems to changes in flotation reagent concentrations. Plants processing refractory metal concentrates to end products generally are associated with municipal water systems and show high materials recoveries with concurrent close control and careful segregation of waste water streams. Neutralization with filtration of acid wastes is a common practice of the plants surveyed. The small amount of information available for the primary gold and silver industries shows greatly differing practices, ranging from zero discharge in arid climates to problems with mercury and cyanide contents in waste waters. (See also W74-05116) (EPA)
W74-05117

REUSE OF SOLID WASTE FROM WATER-SOFTENING PROCESSES,
IIT Research Inst., Chicago, Ill.
R. D. Nelson, and E. Vey.
Available from NTIS, Springfield, Va. 22151, PB-224 820, Price $4.25 printed copy; $1.45 microfiche. Environmental Protection Agency Office of Solid Waste Management Programs Publication SW-530-56d, 1973. 108 p, 25 fig, 16 tab, 25 ref, 1 append.

Descriptors: *Water softening, *Sludge disposal, *Calcium carbonate, *Illinois, *Water reuse, Filtration, Drying, *Water treatment, Waste disposal, Sands, Solid wastes, *Dewatering.
Identifiers: Water softening sludge, Sludge reuse.

Methods for dewatering a water softening sludge from the village of Park Forest, Illinois, were studied. Uses for the dewatered sludge or ways in which it can be disposed of were evaluated. The initial concentration of the sludge is between 3.6% and 3.9% solids by weight. The sludge solids contain about 84% calcium carbonate, 11% magnesium hydroxide, and 5% miscellaneous and have 90% of the particles in the 1.5 to 30 micron range. The sludge is suitable for use as a mineral filler in paints, floor coverings, caulking compounds, and bituminous products. It can be mixed with sands, clays, and organic soils to improve their workability and strength characteristics. It can also be used as an agricultural liming material to improve workability and fertility of soils. If required, it can be used as a filler in concrete without adversely affecting strength and shrinkage characteristics. The best method of dewatering the sludge is vacuum filtration after gravity thickening. This dewatering method will produce a filter cake of about 45% solids and an almost clear filtrate which can be returned to the plant. (Knapp-USGS)
W74-05127

REMOVAL OF NITROGEN FROM TILE DRAINAGE-A SUMMARY REPORT, BIO-ENGINEERING ASPECTS OF AGRICULTURAL DRAINAGE, SAN JOAQUIN VALLEY, CALIFORNIA.
California State Dept. of Water Resources, Fresno. San Joaquin District.
Copy available from GPO Sup Doc as EP1.16:13030 ELY5/71-6, $0.50; microfiche from NTIS as PB 215 417 $1.45. Water Pollution Control Research Series, May 1971. 30 p, 6 fig, 2 tab, 6 ref. EPA Project 13030 ELY5/71-6. Contract 14-06-200-3389A.

Descriptors: *Waste water treatment, Nitrogen, *Farm wastes, *Water Pollution Control, Biological treatment, Nitrates, Treatment facilities, *Tile drainage, Denitrification, Algae, Algal control, Bacteria, Filtration, Desalination.
Identifiers: *Algal growth, Algal harvesting, *Bacterial denitrification, *Nitrogen removal, Algal stripping.

Studies by an interagency group have shown that it is technically feasible to reduce 20 mg/l nitrate-nitrogen in agricultural tile drainage to 2-5 mg/l by either algae stripping or bacterial denitrification. Conditions necessary for maximum algal growth

included 8- to 12-inch pond depth, addition of small amounts of nutrients (CO2, Fe, and P), up to four hours of daily mixing and detention times of from 5 to 16 days, depending on the season. The algae were harvested by coagulation-sedimentation followed by vacuum filtration. Bacterial denitrification was tested in anaerobic deep ponds and filters using methanol as a carbon source. Required detention times were on the order of 8 to 50 days for covered ponds (uncovered ponds were not suitable) and 1 to 2 hours for filters. During long-term operation of the filters periodic flushing was required to remove accumulated bacterial biomass. Preliminary cost estimates were $90 and $135 per million gallons for bacterial denitrification (either pond or filter) and algae stripping respectively. Laboratory studies indicated that nitrogen removal effectively lowered the biostimulatory nature of the waste with respect to algal growth in potential receiving waters. Two desalination processes were also studied--electrodialysis and reverse osmosos. Both processes effectively reduced total dissolved solids but neither removed boron, or reduced nitrate to the desired level. (EPA)
W74-05228

SEWERAGE FEASIBILITY STUDY, BROOME COUNTY, NEW YORK, SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.
Clinton Bogert Associates, Fort Lee, N.J.
Broome County Sewer Agency, Broome County, New York, June 1969. 17 p, 1 fig, 5 tab.

Descriptors: *Sewerage, *Long-term planning, *Sewage disposal, *Regional development, *Wastewater treatment, *New York, Capital costs, Planning.
Identifiers: *Broome County(New York), Service costs.

For many years Broome County has relied on its major streams, the Susquehanna and Chenango Rivers, for the disposal of untreated and partly treated sewage from its urban core. Suburban areas within the urban core and the Villages of Lisle, Whitney Point, Windsor and Deposit and the developing Harpursville area in Colesville have relied upon individual disposal systems consisting of septic tanks and tile drainage fields for this purpose. The discharge of partly treated sewage has resulted in the gross pollution of streams. As the areas served by septic tanks and tile drainage fields have become more densely developed, increasing numbers of failures have been observed resulting in the overflow of septic tank effluent to the ground surface or to small water courses. These conditions should no longer be tolerated. Estimates made for this report indicate the County population should grow from about 230,000 at present to about 410,000 in 2020. The necessary growth in industrial and commercial facilities requires the extension of sewers to the developing areas that are contiguous to the older population centers in the urban core. Sewer extensions within the next few years should provide service to areas in Chenango, Conklin, Dickinson, Fenton, Kirkwood, Union and Vestal. About 1990, sewer extensions should be required into the Town of Maine. In addition to the urban core, population densities in the Villages of Deposit, Lisle, Whitney Point and Windsor now justify the construction of communal sewers. The Harpursville area in the Town of Colesville should develop to the point where sewers should be justified about 1980. (Poertner)
W74-05233

URBAN WATER RESOURCES--POLITICS OF MANAGEMENT,
Bacon and Thomas, Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-05235

REGIONAL WATER AND SEWER PLAN, THE MID-MISSOURI REGION.
Preston (D. R.), Holts Summit, Mo.
Mid-Missouri Regional Planning Commission, Jefferson City, Missouri, 1972. 269 p, 80 fig, 6 tab. FHA Grant.

Descriptors: *Planning, *Water supply, *Sewerage, *Regional development, Municipal water, Sewers, Sewage treatment, Water demand, Water resources development.

A plan was prepared to serve as a coordinated guide for the development of water and sewer service to citizens of the Mid-Missouri Region. It is primarily directed to the rural areas and those communities having a population of less than 5,500 persons. The plan provides information on existing water and sewer systems and recommendations for additional systems needed in future years. The plan covers many counties in mid-Missouri the land area of which is predominately rural. The largest urban communities included are Jefferson City, Columbia, Fulton, Mexico, Centralia, Fayette, Booneville, Glasgow, Tipton, California, and Vandalia. A four-step planning process was used in the development of sewer system plan recommendations. This involved inventory of systems, population forecasts, identifying deficiencies, and analysis of the foregoing. General recommendations in both map and text form are given for each community in the region. The water system plan is divided into two related sections. The first concerns public water supply districts while the second concerns municipal water supply systems. Planning the water systems involved making an inventory of existing systems, applying general standards against the existing systems and population projections, and analysis of the foregoing. There are thirty public water supply districts in the mid-Missouri Region. They vary in size and serve rural areas having from 70 customers to more than 1,000 users. The total population served in 1972 was about 26,000 persons. (Poertner)
W74-05238

AREA-WIDE WATER AND SEWERAGE SYSTEM PLAN AND CAPITAL IMPROVEMENT PROGRAM.
Harte (John G.) Associates, Inc., Atlanta, Ga.; and Harris (Frederic R.), Inc., Jacksonville, Fla.
Coastal Area Planning and Development Commission, Brunswick, Georgia, May 1973. 215 p, 100 fig, 8 tab. HUD grant CPA-GA-04-04-1002.

Descriptors: *Regional analysis, *Water supply, *Sewerage, *Long-term planning, *Capital costs, *Georgia, Regional development, Future planning, Water resources development, Municipal water, Sewers, Sewage treatment, Industrial wastes, Atlantic coastal plain, Water demand, Waste disposal wells.
Identifiers: *Capital improvement program.

A review and updating of water and sewer studies made previously by the Coastal Area Planning and Development Commission is presented. Included is a summary of improvements proposed in reports of engineering studies. Priorities, projected programs, cost estimates and financing recommendations are given for meeting water supply and sewage disposal needs through 1990. Population and economic trends for the region are discussed. These statistics indicate that in other than the major municipalities and their suburbs, growth will be slow. For this reason, programs in the rural areas are largely limited to solving existing public health problems related to improper individual water supply and sewage disposal facilities. The most severe problems facing the major municipalities in the study area are the deterioration of the quality of the water supply brought on by concentration of industrial wells in relatively small areas and the inadequacy of sewerage facilities. The population growth in unincorporated areas around the major municipalities has also resulted in an urgent need for public water and sewer service. (Poertner)
W74-05242

SAGINAW COUNTY WATER AND WASTEWATER UTILITY MASTER PLAN.
Williams (Clyde E.) and Associates, Inc., South Bend, Ind.
Saginaw County Metropolitan Planning Commission, Saginaw, Michigan, May 1971. 245 p, 26 fig, 4 tab, 4 appendices. HUD Mich. P-299 (G).

Descriptors: *Planning, *Water supply, *Sewerage, *Waste water disposal, *Michigan, Municipal water, Water demand, Water resources development, Long-term planning, Storm drains, Capital costs.
Identifiers: *Saginaw County(Michigan).

Guidelines were prepared in the form of an engineering-planning report for use in the formal adoption of the water and wastewater utilities element of the County Development Plan. The report investigates the present status of the County's existing water and wastewater utilities and proposes county-wide water and wastewater utility master plans to the year 1990. Summaries are presented for projects currently under construction and cost estimates of proposed improvements, required to implement the master plans during the short and long range planning periods, are included. Background information is given concerning the County's planning goals and policies, population history and projections, natural physical characteristics, water resources, conservation of the water resources, water and wastewater treatment and preliminary information on storm water drainage problems. (Poertner)
W74-05243

TREATMENT FOR CLARIFYING WHITE WATER COMING FROM A GROUNDWOOD PULP MILL (TRATAMIENTO PARA LA CLARIFICACION DE AGUA BLANCA PROCEDENTE DE LA FABRICACION DE PASTA DE MADERA),
F. Kohn Cornejo.
ATCP (Association Mexicana de Technicos de las Industrias de la Celulosa y del Papel), Vol 13, No 1, p 17-20, Jan/Feb 1973. 1 fig, 2 tab, 3 ref.

Descriptors: *Pulp wastes, *Mexico, *Flocculation, *Coagulation, *Waste water treatment, Operating costs, Cost-benefit ratio, *Water reuse, Recirculated water, Additives, Pulp and paper industry, Slime, Electrolytes, Aluminum, Silica, Industrial water.
Identifiers: *White water, Groundwood mills, Mechanical pulping, Clarifiers, Flocculants, Coagulants, Polyelectrolytes, Alum(Aluminum-potassium sulfate), Aluminum compounds, Activated silica, Chemical consumption.

White water from the grinder room of a groundwood (mechanical pulp) mill was purified in a clarifier basin with addition of flocculants, notably alum, activated silica, and polyelectrolyte. The treated water was found suitable for reuse as process water in a paper mill without requiring microbicidal or algaecidal additives for slime control. The treatment cost slightly over 20 cents per cu m of clarified water. (Speckhard-IPC)
W74-05245

WASTE WATER TREATMENT: USING PURE OXYGEN FOR SECONDARY TREATMENT,
Union Carbide Corp., Tonawanda, N.Y.
L. C. Matsch, and W. C. Dedeke.
Complete M/S (21 p) available from A.I.Ch.E. Publications Dept., New York, N.Y. 10017. Cost $5.00. Chemical Engineering Progress, Vol 69, No 8, p 75-76, Aug 1973.

Descriptors: *Waste water treatment, *Oxidation, *Oxygen, *Pulp wastes, *Aeration, Suspended solids, Sludge, Sedimentation, Settling velocity, Sedimentation rates, Pilot plants, *Virginia, Pulp and paper industry, Dewatering.

The 'Unox' oxygen treatment system of Union Carbide Corp. is said to offer several advantages over the use of air for effluent aeration treatments. Among them are the ability to operate at higher concentrations of mixed liquor suspended solids, faster sludge settling rates, more concentrated underflows, a lesser amount of excess solids generation, superior dewatering ability of the sludge, and better resistance to occasional process shocks. Results are given of pilot plant trials at the West Point, Virginia, pulp mill of Chesapeake Corp. of Virginia. (Hansen-IPC)
W74-05247

A STARCH-FREE EFFLUENT PROGRAM FOR CORRUGATING PLANTS,
Canada Starch Co. Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 5B.
W74-05250

RADIATION OXIDATION OF WATER ADMIXTURES IN WATER-CONTAINING HUMAN WASTES (IN RUSSIAN),
N. V. Bychkov, A. N. Kasperovich, V. V. Krasnoshchekov, V. P. Plotnikova, and Yu. E. Sinyak.
Kosm Biol Med, Vol 6, No 6, p 44-47, 1972, English summary.
Identifiers: Admixtures, Human wastes, *Oxidation, *Radiation, *Water purification, *Waste water treatment, Toxicity.

The radiation method for purifying water-containing human wastes from organic admixtures in the presence of hydrogen peroxide was developed. The effect of radiation dosages on the oxidation of organic admixtures was studied. The toxicological evaluation of regenerated water was performed.--Copyright 1973, Biological Abstracts, Inc.
W74-05252

METHANOL DISTRIBUTION IN AN EVAPORATION PLANT,
Billeruds A.B., Saffle (Sweden).
H. G. I. Arne, and S. Bergkvist.
Svensk Papperstidning, Vol 76, No 10, p 380-382, June 17, 1973. 2 fig, 2 tab, 4 ref.

Descriptors: Water pollution sources, *Pulp wastes, *Alcohols, *Biochemical oxygen demand, Water reuse, *Waste water treatment, Industrial wastes, *Evaporators, *Condensation, Pulp and paper industry, Treatment facilities, Steam, Heat exchangers, Waste disposal.
Identifiers: Kraft pulp mills, Scandinavia, Condensates, Black liquors, Methanol(Or Methyl alcohol).

Condensates from the evaporators of modern kraft mills are usually collected into a single stream from which a portion is withdrawn for reuse in other mill departments while the remainder is sewered and contributes to the BOD load of the receiving stream, mainly due to methanol being present. The distribution of methanol in various streams of a Scandinavian evaporation plant was calculated, using general distillation rules, and the results were verified experimentally. They showed that, for the customary III-IV-V-I-II sequence of liquor feeds, the condensates from the first surface condenser and from effects II and III (including the liquor preheaters) contain only small amounts of methanol and can thus be sewered to make room for the reuse of effect IV and V condensates which contain the main portion of methanol. Because of their small volume and high methanol concentration, condensates from liquor preheater IV and from the second surface condenser can be treated by steam stripping, using the Uddeholm system. The accumulation of methanol to be expected from condensate reuse may be reduced by increasing the steam vent from effect V and by providing it with an extra heat exchanger. Overall results of calculations and experiments indicate that a considerable reduction of condensate-caused water pollution is feasible. (Brown-IPC)
W74-05253

EFFECTS OF WASTE WATER RECYCLE IN A PAPERBOARD MILL,
Green Bay Packaging, Inc., Wis.
D. C. Morris.
Journal Water Pollution Control Federation, Vol 45, No 9, p 1939-1945, Sept. 1973. 5 fig, 3 ref.

Descriptors: Recirculated water, *Reverse osmosis, *Recycling, *Waste water treatment, *Pulp wastes, *Water reuse, Water conservation, *Corrosion, Maintenance, Operation and maintenance, *Wisconsin, Pulp and paper industry, Sulfite liquors, Water vapor, Humidity, Water circulation.
Identifiers: Sulfite pulp mills, NSSC(Neutral sulfite semichemical) pulping, Spent sulfite liquors, Board mills, Paper machines, Exhaust hoods.

A reverse osmosis process was installed at the NSSC (neutral sulfite semichemical) pulp and paperboard mill of Green Bay Packaging Inc. at Green Bay, Wisconsin, to concentrate dilute waste waters so that they could be mixed with stronger wastes before final treatment. Because reverse osmosis is expensive, substantial in-house recycling was practiced to reduce the volume of dilute wastes to be treated. The recycling procedure caused higher mill temperatures and humidities and shortened the service life of equipment through corrosion by the greater concentration of chemicals dissolved in circulating vapors and liquids. A hood had to be installed over the paper machine to protect the hall's roof from condensation droplets. Equipment maintenance also increased accordingly. (Witt-IPC)
W74-05254

WATER AND WASTE WATER PROBLEMS IN MODERN TEXTILE FINISHING PLANTS (WASSER- UND ABWASSERPROBLEME IM MODERNEN TEXTILVEREDLUNGSBETRIEB),
A. Stiebert.
Melliand Textilberichte, Vol 54, No 8, p 864-870, Aug. 1973. 3 ref.

Descriptors: *Textiles, *Water pollution sources, *Industrial wastes, *Waste water treatment, Water conservation, *Recycling, Economic efficiency, *Water reuse, Water purification, Dyes, Dye concentrations, Education, Manpower, Training, Costs, Biological treatment, Disinfection, Water softening, Corrosion, Sludge disposal, Organic loading.
Identifiers: Textile finishing, Mercerization.

Ground waters (well waters) and surface waters for use in textile finishing operations may require various pretreatments for removal of hardness, algae, coliform bacteria, and corrosive components. Waste water problems of the textile finishing industry involve mainly dyes, fixatives, the recovery of mercerizing liquors, sludge disposal, and general economic decisions. Several practical solutions to these problems are discussed. Outside consultants are not the sole answer, since local conditions influence results. Education and training of factory workers are essential to the success of any treatment installation. Water conservation through recycling is gaining in importance. A comparison of costs for different water purification processes indicates that biological effluent treatments are both difficult and costly. It is proposed to treat effluents containing strong organic loadings separately and to pass them to a municipal installation for biological processing. (Brown-IPC)
W74-05255

EFFLUENT -- FIBRE RECOVERY -- WATER SAVINGS: A METHOD TO ANALYSE AND TACKLE THE PROBLEMS,
K. D. Blundell.
Paper (London), Vol 179, No 3, p 118, 120-122, Feb. 7, 1973. 1 fig.

Descriptors: *Waste water treatment, *Pollution abatement, Water conservation, *Pulp wastes, *Pulp and paper industry, *Treatment facilities, Equipment, Biochemical oxygen demand, Suspended solids, Color, Cooling, Thermal pollution, Sludge treatment, Sludge disposal, Dewatering, Effluents, Waste treatment, Water pollution treatment.
Identifiers: Paper mills, Board mills, Savealls, Fiber recovery, Concentrating(Dewatering).

A broad outline is given of a systematic approach to the solution of effluent disposal, fiber recovery, and water conservation problems in paper and paperboard mills. Types of available equipment are described for dealing with fluctuating effluent volumes, for reducing the BOD and solids content of effluents, cooling thermal discharges, removing color bodies, and for concentrating and disposing of sludges. Guidelines to the selection of the most suitable facilities for specific conditions are also given, along with a list of available fiber-recovery units or savealls. (Witt-IPC)
W74-05257

QUICK BROWN FOX DOESN'T TRIP OVER THILMANY'S EFFLUENT ANYMORE,
M. MacLeod.
Paper Trade Journal, Vol 157, No 20, p 36-40, May 14, 1973. 4 fig.

Descriptors: *Treatment facilities, *Pulp wastes, *Wisconsin, *Pulp and paper industry, *Water conservation, Economic impact, Water reuse, Effluents, Pollution abatement, *Waste water treatment, Industrial wastes, Costs, Capital costs.
Identifiers: Kraft mills.

Thilmany Pulp and Paper Co., a division of Hammermill Paper Co., operates an integrated kraft pulp and paper mill and converting plant at Kaukauna, Wisconsin, on the lower Fox River. An environmental improvement program costing ca. $2.4 million was successfully financed via a municipal revenue bond issue and was recently completed to supplement existing treatment facilities. The installation comprises both external and internal effluent treatment measures. Internal water conservation measures include an extended white water collection system, high-pressure machine cleaning showers, reuse of decontaminated evaporator condenser water, and fiber-recovery savealls. The external treatment of 23 million gal/day of waste water involves an 186-ft diameter clarifier basin designed to remove 75% of suspended solids and 50% of 5-day BOD, a centrifugal sludge dewatering system employing pressure filters, and two biological oxidation lagoons of 30 million gal capacity each. A flowchart of the entire system, including auxiliary equipment, is included. (Witt-IPC)
W74-05258

THE PURIFICATION OF RESIDUAL WASTE WATERS OF THE SULFITE PULP INDUSTRY (DIE REINIGUNG VON RESTABWAESSERN DER SULFITZELLSTOFF-INDUSTRIE),
Cellulose Attisholz A.G., Luterbach (Switzerland).
A. Scherler.
Das Papier, Vol 26, No 10A, p 637-642, Oct. 1972. 8 fig, 2 tab. English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Bleaching wastes, *Sulfite liquors, Pulp and paper industry, Biological treatment, Capital costs, Operating costs, Costs, Economic efficiency, Biochemical oxygen demand, Chemical oxygen demand, Europe, Waste treatment, Ef-

fluents, Water pollution sources, Eutrophication, Treatment facilities.
Identifiers: *Switzerland, Attisholz process, Bentonite process, Evaporation condensates, Bleach plants, Sulfite pulp mills, Spent sulfite liquors, Ammonium base sulfite process, Acid sulfite pulping.

With exception of ammonium-base spent sulfite liquor, which may contribute to water eutrophication, the effluents generated by various acid sulfite pulping processes do not differ sufficiently in water pollution loads to warrant switching from one to another for environmental protection only. The biological treatment of sulfite mill effluents, especially the problems posed by evaporator condensates and bleach plant waste waters, are discussed, with emphasis on the Attisholz process. Among nonbiological treatment processes, which are increasing in popularity, the Bentonite process used at a Swiss sulfite pulp mill is of special interest. Assuming that 97% of all effluents are subjected to combined mechanochemical plus biological treatment, one can expect a reduction in 5-day BOD to 9-10 kg per 100 kg of oven-dry pulp produced. The achievable degree of purification is somewhat less for softwood-derived than for hardwood-derived sulfite mill effluents. Typical COD and BOD balances are illustrated. A two-stage biological treatment plant designed for a hydraulic load of 2500 cu m/hr and a 5-day BOD loading of 18 t/day would require an investment of 12.6 million Swiss francs. Operating costs are estimated at 2.35 million francs. Together with interest charges of 1.2 million francs, the total cost for waste water purification runs to 0.158 francs/cu m. (Wise-IPC)
W74-05260

SURVEY OF RESIDUAL WASTE WATER TREATMENT (UEBERBLICK UEBER DIE BEHANDLUNG DER RESTABWAESSER),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungesstelle.
W. Brecht.
Das Papier, Vol 26, No 10A, p 625-628, Oct. 1972. English summary.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Pulp and paper industry, *Biological treatment, Waste water(Pollution), Water pollution sources, Organic loading, Biochemical oxygen demand, Effluents, Industrial wastes, *Pollution abatement, Sludge disposal, Europe, Waste treatment, Regulation, Legislation, Governments.
Identifiers: Paper mills, Pulp mills, Sulfite pulp mills, White water, Germany, Switzerland.

Increasingly strict government regulations for water quality control in Germany will force pulp and paper mills to add secondary (biological or nonbiological) treatment facilities to their primary mechanical-chemical effluent purification installations, so as to remove organic pollutants in addition to suspended solids. The major effluent treatment methods available to the pulp and paper industry are listed, and disposal of the resulting sludge is also mentioned. Differences in the characteristics of paper vs. pulp mill wastes are pointed out, as they affect the selection of an adequate treatment sequence. Thus, residual paper mill white water contributes only about 6 kg of 5-day BOD per ton of paper to the pollution load, compared to 50 kg of oxygen per ton of sulfite pulp produced. The former load is equivalent to the sewage generated daily by 80 people, the latter equivalent to that produced by a population of 750. Several Swiss sulfite mills had to shut down for environmental protection reasons. (Wise-IPC)
W74-05261

BIOLOGICAL AND NONBIOLOGICAL PROCESSES FOR REMOVING DISSOLVED ORGANIC SUBSTANCES FROM RESIDUAL WASTE WATERS (BIOLOGISCHE UND NICHTBIOLOGISCHE VERFAHREN ZUR ENTFERNUNG GELOESTER ORGANISCHER SUBSTANZEN AUS RESTABWAESSERN),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
H-L. Dalpke.
Das Papier, Vol 26, No 10A, p 631-635 (discussion p 635-637), Oct. 1972. 2 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Organic wastes, Pulp and paper industry, *Aerated lagoons, *Activated sludge, *Biological treatment, Filtration, Filters, *Trickling filters, Biodegradation, Oxidation, Adsorption, Incineration, Electrolysis, Electrodialysis, Flotation, Catalysts, Reverse osmosis, Chemical precipitation, Radiation, Ion exchange, Evaporation, Freeze drying, Ion transport, Organic loading, Dissolved solids, Effluents.
Identifiers: Concentrating(Thickening), Wet combustion(Chemical oxidation), Electroflotation.

Three types of biological effluent treatment processes are distinguished: (1) Aerated stabilization ponds merely accelerate natural bio-oxidative degradation of pollutants. (2) Single- and multistage activated sludge processes can operate with surface aeration or pressure aeration. (3) Fixed biological substrates, such as trickling filters, have been used commercially, but generally less effectively than activated sludge methods, of which a great variety are possible. Among nonbiological processes outlined are (1) adsorption (on activated carbon, flyash, sludge-derived coke, or synthetic adsorbents); (2) catalytic oxidation; (3) wet combustion (at high or low pressure); (4) direct-current treatments (electroflotation, electrodialysis, and electrolysis); (5) chemical precipitation (with or without chemical recovery); (6) reverse osmosis; (7) ion-exchange; (8) gamma-irradiation; (9) thickening or concentrating (by evaporation or freeze drying). The relative merits of these (largely still experimental) nonbiological methods are pointed out, with special regard to their applicability in the pulp and paper industry. (Wise-IPC)
W74-05262

REMOVAL OF RESIDUAL WASTE WATER SLUDGES (BESEITIGUNG DER RESTABWASSERSCHLAEMME),
Muenchen-Dachauer Papierfabriken Heinrich Nicolaus G.m.b.H. (West Germany).
G. Strittmatter.
Das Papier, Vol 26, No 10A, p 649-654 (discussion p 654-657), Oct. 1972. 8 fig, 3 ref. English summary.

Descriptors: *Sludge treatment, Sludge disposal, *Waste water treatment, *Pulp wastes, *Dewatering, *Drying, *Byproducts, *Incineration, Fertilizers, Recycling, Solid wastes, Humus, Fibers(Plant), Fuels, Filters, Filtration, Centrifugation, Treatment facilities, Equipment, Sedimentation, Settling basins, Separation techniques, Industrial wastes.
Identifiers: Composting, Vacuum filters, Presses, Screw presses, Filter presses, Belt filters, Boards, Board mills, Insulation boards, Panel boards, Paperboards, Building boards, Fiberboards, White water.

All pulp and paper mill waste water treatments produce fibrous sludge, regardless of whether they use chemical, mechanical, biological, or combined processes. Since the dry solids content of sludges ranges from 1 to 8%, economical handling methods require thickening (concentrating), dewatering, and drying steps prior to disposal or reuse. Equipment and techniques available for these processing steps are reviewed and illustrated, notably decanters, skimmers, centrifuges of various kinds, hydrostatic and vacuum filters, and filter, belt, and screw presses. While the solids-liquid separation technology has made significant strides, problems of satisfactory sludge disposal still await adequate solutions. Among reported commercial possibilities of sludge reuse are composting (to humus), combustion (as fuel), and resale to mills making paperboards, panel boards, insulation boards, and flame-retardant building boards. (Wise-IPC)
W74-05263

INSTALLATION OF WASTE WATER AND SLUDGE TREATMENT FACILITIES AT THE ARJOMARI-PRIOUX PAPER MILL AT RIVES-SUR-FURE (INSTALLATION DE TRAITEMENT DES EAUX RESIDUAIRES ET DES BOUES DE LA PAPETERIE ARJOMARI PRIOUX A RIVES-SUR-FURE).
Papier, Carton, Cellulose, Vol 22, No 1-2, p 40-43, January-February 1973. 6 fig, 2 tab.

Descriptors: *Waste water treatment, *Treatment facilities, *Pulp wastes, Europe, *Flocculation, *Coagulation, *Sludge treatment, Pulp and paper industry, Operating costs.
Identifiers: Sedimat flocculator, Clarifiers, *France.

Automated waste water and sludge treatment facilities at a French paper mill are described. They center around a 'Sedimat' flocculator-clarifier which permits sludge recirculation. Chemical (coagulant) consumption and operating experiences are reported. (Speckhard-IPC)
W74-05264

WHITHER CLARIFIED SLUDGE. (WOHIN MIT DEM KLAERSCHLAMM.),
For primary bibliographic entry see Field 5E.
W74-05266

PURIFICATION OF BLEACHED KRAFT MILL EFFLUENTS BY ACTIVATED SLUDGE TREATMENT (OCZYSZCZANIE METODA OSADU CZYNNEGO SCIEKOW Z PRODUKCJI MASY CELULOZOWEJ SIARCZANOWEJ BIELONEJ),
Z. Skwara, K. Lelonkiewicz, and C. Leszczynski.
Przeglad Papierniczy, Vol 29, No 5, p 178-183, May 1973. 2 tab, 2 fig, 23 ref. English summary.

Descriptors: *Activated sludge, *Biological treatment, *Pulp wastes, *Bleaching wastes, *Waste water treatment, *Aeration, Evaporation, Biochemical oxygen demand, Settling basins, Nutrients, Phosphates, Sulfates, Ammonium salts, Organic loading, Suspended solids, Europe, Pulp and paper industry, Laboratory tests.
Identifiers: Kraft mills, *Poland, Condensates, Evaporator condensates, Black liquors, White water.

Two kinds of effluents from the Kostrzyn kraft mill (Poland) were subjected to laboratory treatments with activated sludge to study the effects of aeration time, BOD loading, and proportion of evaporator condensates. Both effluents contained ca. 100 mg oxygen per liter. One stream came from the digester room, pulp washing and screening, bleaching, and the pulp-drying machine ('wet machine'). It was mixed in 4:1 and 2:1 ratios with the other stream coming from the soda recovery boiler, black liquor evaporator, causticizer, and sulfate soap acidulation plant. After 1-hr sedimentation of suspended solids, both mixtures were aerated in 4 different tanks with addition of ammonium sulfate and potassium dihydrogen phosphate in the nitrogen to phosphorus ratio 2.5:0.5 per 100 parts of 5-day BOD, and with pH adjusted to 7.5. Activated sludge from secondary settling tanks was recycled to the continuously fed aeration tanks (8 liter capacity each). The BOD load was kept at 0.1 or 0.13-0.15 g per g of sludge per day. BOD reductions observed were 77% after 4 days and 90% after 7 days, using relatively low sludge concentrations (1-2 kg/cu m). Increasing the proportion of evaporator condensates in the effluent reduced the BOD removal to 87.3%. (Stapinski-IPC)
W74-05267

HOW MUCH WILL CLEANUP COST,
F. G. Hurtubise, D. Jones, and H. D. Paavila.
Pulp and Paper Magazine of Canada, Vol 74, No 9, p 48, 50, Sept. 1973.

Descriptors: *Economic impact, *Treatment facilities, *Pulp and paper industry, *Canada, *Pollution abatement, *Costs, Capital costs, Operating costs, Water reuse, Water consumption(Excluding consumptive use), Legislation, Regulation, Water quality standards, Water quality control, Waste water treatment.

Under regional antipollution regulations, the Canadian pulp and paper industry spent $195 million in 1960-1971 on water pollution abatement, viz., $130 million for in-plant improvements and $65 million on external treatment facilities. These measures reduced effluent BOD by 33%, water use by 19%, and suspended solids by 72% per ton of product. The 1971 federal water quality standards will require additional investments of $9,700 capital plus $3.91 operating cost per daily ton produced. Meeting the program's goal will cost the Canadian industry over $500 million. Data from a survey of various mills are included to support these estimates. (Brown-IPC)
W74-05268

COMBINED MILL EFFLUENT GOES TO AERATION POND IN PE (POLYETHYLENE) PIPELINE.
Pulp and Paper, Vol 47, No 4, p 112-113, April 1973. 2 illus.

Descriptors: Treatment facilities, *Pulp wastes, *Pipelines, *Plastics, *Bleaching wastes, *Waste water treatment, Industrial wastes, *Construction materials, Steel, *Oregon, Pulp and paper industry, Aerated lagoons, Corrosion.
Identifiers: Polyethylene, Willamette River(Oregon), Materials handling.

At the pulp and paper mill of Boise Cascade Corp. at Salem, Oregon, a high-density polyethylene pipeline was installed to convey effluents to an aeration pond for secondary treatment prior to discharge into the Willamette River. The pipeline carries a mixture of spent sulfite cooking liquor, bleach plant effluent, evaporator condensate, and paper mill white water. Resistance to corrosive liquids and ease of installation on land and under water are the major advantages of polyethylene over conventional wrapped or coated steel pipe. (Witt-IPC)
W74-05269

POLLUTION -- YESTERDAY, TODAY, AND TOMORROW,
T. W. Beak.
Pulp and Paper Magazine of Canada, Vol 74, No 11, p 25-26, 28-29, Nov 1973. 1 illus.

Descriptors: *Pollution abatement, *Pulp and paper industry, *United States, *Canada, Attitudes, Psychological aspects, *Social aspects, *Environmental control, Regulation, Legislation, Water quality standards, Governments.
Identifiers: Public relations, Cooperation.

Changes in water pollution by the Canadian pulp and paper industry and in abatement technology, economics, and attitudes from the 1950's to the present are discussed. Lessons to be learned from past over- and underreactions to environmental problems in North America are emphasized. The importance of good clean housekeeping practices is illustrated, along with the need to look beyond in-plant control measures. The paper industry must regain public confidence that it can and does operate without disrupting the environment. Cooperation with the proper authorities should convince the latter that their insistence on nationwide uniform effluent standards is not the answer to local situations. The vital function of professional consultants and service industries in fostering sound, objective attitudes is keynoted. (Brown-IPC)
W74-05272

MEASURES AGAINST WATER POLLUTION IN MECHANICAL PULP AND PAPER MILLS,
Stora Kopparbergs Bergslags A.B., Kvarnsveden (Sweden). Kvarnsvedens Pappersbruk.
A. Wichman.
Pure and Applied Chemistry, Vol 29, p 291-298, 1972. 2 fig, 3 ref.

Descriptors: *Waste water treatment, *Pulp wastes, Europe, Pulp and paper industry, Flotation, Flocculation, Sedimentation, Research priorities, *Pollution abatement.
Identifiers: *Sweden(Kvarnsveden), Newsprint mills, Groundwood mills.

A description is given of water pollution control measures taken at the groundwood and newsprint mill of Stora Kopparberg Bergslags AB. in Kvarnsveden, Sweden. The need for further fundamental data on the mechanisms of flotation, flocculation, and sedimentation processes is emphasized. An appeal is made for cooperative research by all parties interested in water pollution abatement and environmental protection. (Buchanan-IPC)
W74-05273

RECYCLING WATER -- A SIMPLE SOLUTION,
Masonite Corp., Laurel, Miss.
J. E. Leker, and W. C. Parsons.
Southern Pulp and Paper Manufacturer, Vol 36, No 1, p 32-34, Jan 10, 1973. 4 fig, 10 ref.

Descriptors: *Waste water treatment, *Pulp wastes, *Recycling, *Water quality control, *Recirculated water, *Mississippi, Pulp and paper industry, Effluents, Water reuse, Reclaimed water, Evaporation, Evaporators, Suspended solids, Byproducts, Biological treatment, Aerated lagoons, Sludge treatment, Incineration, Sludge disposal, Discharge(Water), Sedimentation, Settling basins.

Difficulties of finding simple solutions to meeting antipollution water quality standards are discussed in the context of waste water treatment measures taken at Masonite Corp.'s pulp and board mill in Laurel, Mississippi, where a facility was designed for treating 7 million gal of effluent per day according to standards existing in 1970. An initial survey showed that the mill produced daily 257,000 lb of BOD and 40,000 lb of suspended solids. About 90% of the BOD was contained in the wash water from steam-processed pulp which amounted to less than 15% of the total waste water flow. This stream of wash water is concentrated in a quintuple-effect evaporator. Residual solids are converted into a marketable product. Two other effluent streams (process water plus cooling, sealing, and housekeeping waters) are handled separately in primary clarifiers from which 90% of treated water is recycled to the mill, the remainder being diluted with the second stream and treated in a biological contact-stabilization system. Overflows pass to a 10-acre aerated lagoon for polishing before reuse or discharge. Sedimented solids from the primary treatment are burned, disposed of as landfill, or utilized in other industries. An unsolved problem is the disposal of 20 t/day of excess biological sludge which is difficult to dewater. (Hansen-IPC)
W74-05274

EFFLUENT-FREE BLEACHED KRAFT PULP MILL: PRESENT STATE OF DEVELOPMENT,
Toronto Univ. (Ontario). Dept. of Chemical Engineering.
H. W. Rapson, and D. W. Reeve.
Tappi, Vol 56, No 9, p 112-115, Sept. 1973. 2 fig, 25 ref.

Descriptors: Water conservation, *Water reuse, *Pulp and paper industry, *Bleaching wastes, *Pulp wastes, Effluents, *Waste water treatment, Chlorine, Equipment, Sodium sulfate, Evaporation, Sodium chloride, Waste water(Pollution), Water circulation, Reclaimed water, Recirculated water.
Identifiers: Wash water, Evaporator condensates, Bleach plants, Kraft mills, Chlorine dioxide, Spent liquors, R-3 chlorine dioxide bleaching process, Pulp washing, Countercurrent processes, White liquors, Chemical recovery.

All aqueous effluents from bleached kraft pulp mills can be eliminated by recoverying and reusing all the water and chemicals required for bleaching. None of the process changes that would be involved are radical departures from existing technology, and none of the equipment needs are novel. Pulp can be washed completely countercurrently, from the last washer in the bleach plant to the first brown stock washer. A substantial portion of chlorine in the chlorination stage can be substituted by chlorine dioxide. Evaporator condensates can be steam- and air-stripped and reused to wash the bleached pulp. Salt (NaCl) is recoverable from the spent bleach liquor by evaporation of the white liquor and may be used to regenerate bleaching chemicals. All the chlorine and chlorine dioxide needed for bleaching, as well as the sodium sulfate used as cooking liquor makeup, are presently producible in the so-called 'R-3' process by the chlorine dioxide generator-evaporator-crystallizer. The design and development status of effluent-free kraft mills is discussed in the light of these possibilities. (Brown-IPC)
W74-05275

A MATHEMATICAL MODEL FOR OPTIMIZING THE DESIGN OF REVERSE OSMOSIS SYSTEMS,
Institute of Paper Chemistry, Appleton, Wis.
I. K. Bansal, and A. J. Wiley.
Tappi, Vol 56, No 10, p 112-115, Oct 1973. 3 fig, 9 ref, 4 tab.

Descriptors: *Reverse osmosis, *Waste water treatment, *Pulp wastes, *Optimization, *Mathematical models, *Simulation analysis, *Cost analysis, Cost-benefit analysis, Operating costs, Capital costs, Effluents, Maintenance, Osmotic pressure, Flow, Depreciation, Design data, Water pollution treatment, Reclaimed water, Pulp and paper industry, Sodium chloride, Pipelines.
Identifiers: Concentrating(Dewatering), Flux rate, Salt rejection.

A computerized mathematical model was developed for the optimal design of large-scale reverse osmosis (R.O.) systems to be used for concentrating dilute effluents of the pulp and paper industry. The model calculates the number of modules needed and their best configuration by optimizing the capital and operating costs of a large multistage concentrating system. This model was found to be sensitive to the reference NaCl flux rate, the osmotic pressure of liquors being processed, module depreciation, module cost per square foot of membrane, and module maintenance cost. Agreement between experimental data and results obtained with the mathematical model was within 10%. For the design of a manifolding and piping system of R.O. units, the number of modules operated in series seemed to be more important than the number of stages and the recovery ratios of water in each stage. Probably, the equivalent of two 18-tube modules in series (250-300 total linear feet) is optimum for 1/2-inch inside-diameter tubular modules, based on present capital and operating costs of an R.O. concentrating system. (Brown-IPC)
W74-05276

ECONOMIC IMPACT OF POLLUTION ABATEMENT ON THE SULFITE SEGMENT OF THE U.S. PULP AND PAPER INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
C. Canty, F. G. Perry, Jr., and L. R. Woodland.
Tappi, Vol 56, No 9, p 52-55, Sept. 1973. 1 fig, 2 ref, 2 tab.

Descriptors: Cost-benefit ratio, Sulfite liquors, Pulp wastes, *Economic impact, *Pulp and paper industry, *Pollution abatement, *Regulation, *Treatment facilities, *Waste water treatment, Bleaching wastes, Water quality standards, Water quality control, Effluents, Capital costs, Operating costs, Legislation, Industrial wastes, Discharge(Water), Water pollution sources, Profit, Unemployment, Incineration, Byproducts, Biological treatment, United States.
Identifiers: Sulfite pulp mills, Spent sulfite liquor, Spent pulping liquors, Chemical recovery.

The probable impact of antipollution legislation on the economies of U.S. sulfite pulp and paper mills is discussed. The most serious effluent problem is caused by spent sulfite pulping liquors. Three treatment methods are compared with regard to efficiency and costs, viz., biological process, by-product recovery, and incineration. Capital investments and operating costs for treatment of spent bleach plant liquors, for removal of suspended solids, and for air pollution control are also presented. Seven U.S. sulfite mills having a total production capacity of 400,000 tons/year may not be able to cope with regulatory water quality demands, and may close down by 1976. Four additional mills with 470,000 t/yr combined capacities are operating with marginal profitability. Although shutdowns may cause regional temporary unemployment, salutary effects should include improved product supply-demand balance and better water utilization with increased recovery of fibers, chemicals, and heat to help reduce the pollution abatement costs. Most mills will incur comparable expenses to meet water quality standards and should be able to remain competitive. (Brown-IPC)
W74-05277

CHARACTERIZATION OF SULFITE PULPING EFFLUENTS AND AVAILABLE ALTERNATIVE TREATMENT METHODS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
R. O. Blosser, and I. Gellman.
Tappi, Vol 56, No 9, p 46-50, Sept. 1973. 3 tab, 7 ref.

Descriptors: *Pulp wastes, *Sulfite liquors, *Pollution abatement, *Waste water treatment, *Water pollution sources, Regulation, Pulp and paper industry, United States, Management, Decision making, Treatment facilities, Industrial wastes, Pennsylvania, Washington, Florida, Effluents, Waste water(Pollution).
Identifiers: Chemical recovery, Pulp mills, Sulfite pulp mills.

The sources, volumes, compositions, and other characteristics of effluents from sulfite pulp mills using Ca-, Mg-, Na-, or ammonia-base cooking liquors are reviewed. Trends in the adoption of various chemical recovery systems, installation of accompanying external effluent treatment facilities, and decisions on expansion vs. termination of sulfite mills in response to pollution control regulations are described. Case histories are presented to document the viability of various management decisions, notably the measures adopted at Charmin Paper Products Co. (Mehoopany, Pa.), Crown-Zellerbach Corp. (Camas, Wash.), ITT Rayonier Inc. (Fernandina Beach, Fla.), and Weyerhaeuser Co. (Cosmopolis, Wash.). (Brown-IPC)
W74-05278

HOT PROBLEM SOLVED BY AERATED LAGOON,
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
C. E. Adams.
Water and Wastes Engineering, Vol 9, p E8-E11, Sept. 1972. 5 tab, 1 diag.

Descriptors: Cooling, *Cooling towers, *Aerated lagoons, *Waste water treatment, *Pulp wastes, Cost-benefit ratio, *Economic efficiency, Operating cost, Capital cost, *Thermal pollution, Effluents, Pulp and paper industry, Temperature, Lagoons, Biological treatment, Industrial wastes.

A computer program was developed for comparing the merits of an aerated lagoon with those of a cooling tower for the purpose of reducing the temperature of paper mill effluents to a level suitable for biological treatment. For the particular case studied, aeration proved to be more economical than a cooling tower. Aeration required more land, but this was offset by the initial cost of the tower. The deciding factor was the high operating cost for pumping the wastes to the tower. In regions where land is more expensive, cooling towers could be the more economical way of preventing thermal pollution. (Buchanan-IPC)
W74-05280

CLOSED WATER CIRCULATION SYSTEM IN A PAPER AND PAPERBOARD MILL (GESCHLOSSENER WASSERKREISLAUF IN EINER PAPIER-UND KARTONFABRIK),
Papier- und Kartonfabrik Ofteringen (West Germany).
H. Widmer, and O. Widmer.
Wochenblatt fuer Papierfabrikation, Vol 100, No 23/24, p 930-932, Dec 15, 1972. 2 fig.

Descriptors: *Pulp and paper industry, Water conservation, *Recirculated water, *Water reuse, *Industrial water, *Waste water treatment, *Flotation, Discharge(Water), Effluents, Equipment, Treatment facilities, Pesticides, Additives, Slime, Microorganisms, Reclaimed water, Recycling.
Identifiers: *White water, Savealls, Paper machines, Board machines, Fourdrinier machines, Cylinder (Board) machines.

A completely closed water circulation system for paper and board machines is described, based on treatment of white water in flotation savealls with addition of a nontoxic slime-control additive. Experience with this system in two fourdrinier and two combined fourdrinier/cylinder machines for production of corrugating media, coated and uncoated paperboards, and packaging papers showed it to permit machine operation with a minimum of fresh water intake and practically no effluent discharge, without any adverse effects on product quality and production rate. (Speckhard-IPC)
W74-05281

FUNDAMENTAL VIEW OF THE CLOSED WATER CIRCUIT (DER GESCHLOSSENE WASSERKREISLAUF IN GRUNDSAETZLICHER BETRACHTUNG),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
W. Brecht, and H-L. Dalpke.
Wochenblatt fuer Papierfabrikation, Vol 101, No 8, p 235-241, April 30, 1973. 1 fig, 32 ref.

Descriptors: *Water reuse, *Pulp and paper industry, Water circulation, *Water conservation, Waste water(Pollution), Water pollution sources, Pollution abatement, Discharge(Water), *Economic feasibility, *Reviews, *Recycling.
Identifiers: White water, Paper machines.

A critical review of literature reporting experience with the closing or partial closing of process water circulation systems in paper mills discusses the planning and engineering stages involved in circuit closure, its advantages for pollution abatement, and its disadvantages or problems. The applicability of this technique is presently still limited, but holds promise of minimizing the discharge of aqueous effluents. Total effluent elimination, e.g., by the development of 'dry' (pneumatic) and synthetic paper manufacturing processes, will not be able to fill the increasing demand for paper. (Speckhard-IPC)
W74-05282

EXPERIENCES WITH CHEMICAL PRE-PURIFICATION OF KRAFT MILL WASTE WATER WITH MAGNESIUM CHLORIDE BRINE (POTASSIUM EXTRACTION LIQUOR) (ERFAHRUNGEN BEI DER CHEMISCHEN VORREINIGUNG VON SULFATZELLSTOFFABWASSER MIT MAGNESIUMCHLORID-SOLE (KALIENDLAUGE),
VEB Zellstoff- und Papierkombinat Trebsen (East Germany).
K. Schmidt, and D. Schladebach.
Zellstoff und Papier, Vol 22, No 2, p 45-49, Feb. 1973. 9 fig, 4 ref.

Descriptors: *Waste water treatment, *Pulp wastes, *Coagulation, *Chemical precipitation *Colloids, *Dissolved solids, Magnesium compounds, Chlorides, Lime, Sedimentation rates Sludge, Chemical oxygen demand, Pulp and paper industry, Byproducts.
Identifiers: Magnesium chloride, Wash waters.

Magnesium chloride, which is available in large amounts as a by-product of the potassium industry, can be used to precipitate colloids and dissolved solids from pulp wash waters. Sedimentation can be improved by additions of quick lime or caustic sludge. Treatment of pulp waste waters with 1.4 g of magnesium chloride per liter of effluent was found to reduce the COD by ca. 30%. (Ward-IPC)
W74-05283

WOOD WASTE REUSE IN CONTROLLED RELEASE PESTICIDES,
Washington Univ., Seattle. Inst. of Forest Products.
G. G. Allan, C. S. Chopra, R. I. Gara, A. N. Neogi, and R. M. Wilkins.
Available from the National Technical Information Service as PB-222 051, $4.85 in paper copy $1.45 in microfiche. Environmental Protection Agency report EPA 670/2-73-034, July, 1973. 86 p 16 tab, 14 fig, 124 ref. EPA grant EP 00319/Program Element No 1D2311.

Descriptors: *Pesticides, *Herbicides, *Wood wastes, *Lignins, *Cellulose, *Pulp wastes *Forest management, Trees, Coniferous trees Theoretical studies, Economic feasibility, Sawdust, Agricultural chemicals, Chemicals, Solid wastes, Toxicity, Safety.
Identifiers: Lignocellulose, Agricultural wastes, 2 4-D (2-4-dihydroxyphenoxybutyric acid), Controlled release pesticides, Corn cobs, Bagasse, Oat hulls.

The potential utilization of large volumes of agricultural residues, lignins, and wood wastes such as bark, sawdust, corncobs, oat hulls, and sugarcane bagasse, by chemical combination with pesticides was investigated. The preparation of pesticides with prolonged effectiveness and controlled-release characteristics from lignocellulosic wastes is described, and their economics are discussed. Theories permitting the effective period of such compounds to be predicted were developed and validated. Combinations of such wastes with 2,4-D (2,4-dichlorophenoxybutyric acid) were found to yield safely applicable herbicides effective in suppressing weeds and brush in the presence of conifers and in thereby substantially accelerating the growth of trees. (Brown IPC)
W74-05286

INVENTORY OF SPRAY IRRIGATION SYSTEMS IN THE GREAT LAKES BASIN OF CANADA.
Environment Canada, Water Pollution Control Directorate, Economic and Technical Review Report EPS 3-WP-73-5, Oct. 1973. 15 p. 2 tab, 1 map.

Descriptors: *Irrigated land, *Soil disposal fields, *Waste water disposal, *Industrial wastes, *Canada, *Great Lakes Region, Sprinkler irrigation, Seasonal, Winter, Irrigation, Irrigation practices, Irrigation ditches, Pulp wastes, Economic efficiency, Food processing industry, Farm management, Farm wastes, Waste disposal, Surveys.
Identifiers: Ridge and furrow disposal, Underdraining.

This government-authorized survey of industrial and sanitary effluent treatment systems using spray irrigation as partial or total disposal method included 60 industrial plant operations in Ontario, mostly farms and food processors, but also one paper mill (Strathcona Paper Co. Ltd.). The general usefulness of spray irrigation as a relatively cheap waste disposal method is emphasized. In spite of the small land area involved (ca. 2600 acres), nearly 1 billion gal of high-strength wastes are treated thus annually without major problems, such as shock loading. Sprayfield disposal is attractive to small enterprises with low capital, such as dairy and hog farms. Urban expansion and Canadian winters are the two major factors limiting more widespread use of this method. In some instances, ridge-and-furrow disposal is practiced in winter. Underdraining as a supplement to either ridge-and-furrow or spray disposal also deserves investigation, especially for industrial planning where extension of sewage facilities would cause ill-timed expenditures. Land used for irrigation is still available for later building purposes. (Brown-IPC)
W74-05288

A PULP AND PAPER MILL WITH FULLY CLOSED RECIRCULATION SYSTEM -- UTOPIA OR REALISTIC POSSIBILITY. (EINE ZELLSTOFF-UND PAPIERFABRIK MIT VOLLSTAENDIG GESCHLOSSENEM KREISLAUF -- EINE UTOPIE ODER EINE REALISTISCHE MOEGLICHKEIT),
Karlstads Mekaniska Werkstad A.B. (Sweden).
G. Ranhagen.
Zellstoff und Papier, Vol 22, No 6, p 172-179, June 1973. 2 tab, 17 fig.

Descriptors: *Pulp wastes, Pulp and paper industry, *Industrial water, *Waste water treatment, *Pollution abatement, *Recirculated water, Air pollution, Water circulation, Mathematical models, Effluents, *Recycling.
Identifiers: Kraft mills.

Models are presented for various closed water systems with little or no effluent, as well as for pollution-free air systems, in an integrated kraft pulp and paper mill. It is concluded that certain combinations could make the closed system a reality for the kraft industry, not just wishful thinking. (Ward-IPC)
W74-05289

APPLICATION OF MULTIGOAL WATER QUALITY PLANNING MODEL,
Krannert Graduate School of Industrial Administration Administration, Lafayette, Ind.
D. E. Pingry, and A. B. Whinston.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EE1, Proceedings paper No 10322, p 61-75, February 1974. 1 fig, 9 tab, 7 equ, 8 ref.

Descriptors: Environmental engineering, *Indiana, *Water pollution control, *Alternative planning, River basins, Economics, *Comprehensive planning, Temperature, Dissolved oxygen, Cost-benefit analysis, Optimization, Simulation analysis, Treatment facilities, Regional analysis, Methodology, Mathematical models, Systems analysis.
Identifiers: *Nonlinear programming, Multiobjective planning, *Cost minimization, Streeter-Phelps models, *West Fork White River(Ind.).

A methodology which takes advantage of variances in stream assimilative capacity and treats water pollution as a regional, basin-wide problem is applied to the West Fork White River in Indiana. A simulation model of river basin water quality serves as the constraint set for an optimization model that searches for the minimum cost solutions given the quality goals. Specifically, the traditional Streeter-Phelps dissolved oxygen model is integrated with a heat decay model. The resulting quality model is incorporated into a nonlinear programming river basin model which is used to calculate least-cost water treatment systems for the West Fork White River, given several alternative water quality goals. The effect of the different goals on the annual total cost of the system is examined. Special attention is focused on the possibility of relaxing the quality goals downstream from major effluent sources in exchange for increased quality upstream from these sources. The role of the planning model as an information source for decision making is examined. An appendix includes a summary of the nonlinear algorithm used and, in particular, the methods used to handle large-scale problems. (Bell-Cornell)
W74-05384

MODELS FOR ENVIRONMENTAL POLLUTION CONTROL.
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5B.
W74-05386

MODELING OF WASTEWATER DISPOSAL SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
O. G. Lindholm.
In: Models for Environmental Pollution Control, (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 21-40 (Chapter 1), 1973.

Descriptors: *Water pollution control, *Waste water disposal, *Model studies, *Computer models, *Sewage treatment, *Networks, Hydrology, Rainfall-runoff relationships, Storm runoff, Pipes, Storage capacity, Sludge treatment, Optimization, Systems analysis, Costs, *Computer programs.
Identifiers: Gradient techniques.

Presented are four computer programs developed by the Norwegian Institute for Water Research for a total analysis and simulation of sewerage systems. The main objectives of these programs, written in FORTRAN, were to characterize wastewater flow through the various components of the sewerage system, to minimize the leakage of wastewater from the system, and to determine economically optimal systems. The four specific models that were developed are presented: (1) Wastewater and stormwater runoff model; (2) wastewater treatment plant model; (3) sludge treatment plant model; and (4) cost analysis program. The network model describes the pattern of stormwater runoff in the sewer network, determining the variation in discharge at any given point in the network for each minute of a given rainfall. Fifteen features built into the model are given. The sewage treatment plant model studies the performance of such plant receiving both sewage and rainwater runoff over a given period. The sludge treatment plant model considers: thickner, anaerobic digestion, aerobic stabilization, sludge centrifuge, sieve band press, and vacuum filters. The optimization technique used is a combination of a trial-and-error approach and a gradient method. The models may be linked together but at present most are operated independently. (Bell-Cornell)
W74-05388

REGIONAL WASTEWATER MANAGEMENT SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
H. H. Hahn, P. M. Meier, and H. Orth.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 41-60 (Chapter 2), 1973. 4 fig, 2 tab, 5 equ, 16 ref.

Descriptors: *Water pollution control, *Waste water(Pollution), *Treatment facilities, *Alternative planning, *Resource allocation, *Algorithms, Optimization, Methodology, Costs, Benefits, Management, Water transfer, Canals, Networks, Mathematical models, Systems analysis.
Identifiers: *Regional planning, *Branch-and-Bound strategy, *Regional water systems, Nonlinear programming, Search strategy.

There is presently a trend towards regionalization in water supply and wastewater disposal. This tendency is due to a number of factors, including increases in the cost of transporting wastewater over long distances, an increased use of surface water, and pressure from administrations to form regional systems. The individual parts of a sewerage system--interceptors, pumping stations, treatment plants--show economies of scale indicating that cost savings can be obtained through regional systems. Definite advantages and quantitative benefits are procured from planning, constructing, and operating larger plants. A mathematical formulation of the problem and an algorithm for solution are presented. The problem herein is defined by the question: which is the optimal allocation of wastewater to different wastewater treatment plants, located at different points, so that total costs minus total benefits are minimized. The problem is solved using a simultaneous technical and economic optimization. It is necessary to investigate the largest number of meaningful alternatives without excluding some solutions on the basis of engineering judgment; the best utilization of large quantities of information is warrented. A new planning approach for determination of the optimal solution is presented and applied to the above problem. This technique, the Branch-and-Bound strategy, is compared with traditional methods of regional wastewater system planning. (Bell-Cornell)
W74-05389

5E. Ultimate Disposal Of Wastes

OCEAN DUMPING IN THE NEW YORK BIGHT: AN ASSESSMENT OF ENVIRONMENTAL STUDIES,
Coastal Engineering Research Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 5C.
W74-04863

REUSE OF SOLID WASTE FROM WATER-SOFTENING PROCESSES,
IIT Research Inst., Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-05127

RADIOLOGICAL EVALUATIONS FOR ADVANCED WASTE MANAGEMENT STUDIES,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 5B.
W74-05176

REMOVAL OF RESIDUAL WASTE WATER SLUDGES (BESEITIGUNG DER RESTABWASSERSCHLAEMME),
Muenchen-Dachauer Papierfabriken Heinrich Nicolaus G.m.b.H. (West Germany).
For primary bibliographic entry see Field 5D.
W74-05263

WHITHER CLARIFIED SLUDGE. (WOHIN MIT DEM KLAERSCHLAMM.),
R. B. Firnhaber.
Der Papiermacher, Vol 22, No 1, p 12-14, Jan. 20, 1973. 1 fig, 1 tab.

Descriptors: *Sludge disposal, *Pulp wastes, *Incineration, Fuels, Drying, Dewatering, Sludge treatment, Pulp and paper industry, *Waste disposal.
Identifiers: Furnaces.

The possibilities for disposal of clarified industrial sludges by incineration are discussed, including dewatering and drying equipment, furnace designs, and the fuel value of sedimented effluent sludges from paper mills as a function of their chemical composition. In West Germany, 18 million tons of clarifier sludge from effluent treatment are being produced annually with more than 90% water content. As was demonstrated by the city of Zurich, such sludges can be burned together with municipal refuse, provided they are first autoclaved (at 200C and 16 bar pressure) to facilitate their thickening in filter presses to ca. 45% moisture. (Speckhard-IPC)
W74-05266

RECYCLING WATER -- A SIMPLE SOLUTION,
Masonite Corp., Laurel, Miss.
For primary bibliographic entry see Field 5D.
W74-05274

WOOD WASTE REUSE IN CONTROLLED RELEASE PESTICIDES,
Washington Univ., Seattle. Inst. of Forest Products.
For primary bibliographic entry see Field 5D.
W74-05286

INVENTORY OF SPRAY IRRIGATION SYSTEMS IN THE GREAT LAKES BASIN OF CANADA.
For primary bibliographic entry see Field 5D.
W74-05288

5F. Water Treatment and Quality Alteration

PROCEEDINGS OF FOURTH SANITARY ENGINEERING CONFERENCE ON WATER DISTRIBUTION SYSTEMS.
Available from University of Illinois, Publications Office, Urbana, Ill. 61801 for $2.00. Conference conducted by Illinois Dept of Public Health and Univ of Illinois, Feb 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, August 1962. 84 p.

Descriptors: *Water treatment, *Design, *Construction, *Distribution systems, *Corrosion, Hydraulics, Sanitary engineering.
Identifiers: *Pipe materials.

Nine papers pertinent to the hydraulics, design, materials, construction, and maintenance of water distribution systems are presented. Titles are: Hydraulics of Water Distribution Systems; Applications of System Analyzers: A Summary; Pipe Materials, Coatings, and Joints for Water Distribution Systems; Water Main Laying; Tapping, Disinfection, and Inspection of Water Mains; Observing Fire Protection Requirements in Future Water System Design; Maintenance of Water Distribution Systems; Values, Hydrants, and Main Line Meters; and Domestic Service Meters. (See W74-05007 thru W74-05015) (Bean-AWWARF)
W74-05006

HYDRAULICS OF WATER DISTRIBUTION SYSTEMS,
Greeley and Hansen, Chicago, Ill.
C. W. Reh.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, February 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 6-22, August 1962. 16 fig, 3 tab, 4 ref.

Descriptors: *Water distribution(Applied), *Hydraulics, *Municipal water, sMathematical models, Pipelines, Public utilities, Simulation analysis, Pipe flow, Distribution systems, Computer programs.

Methods for the analysis and design of water distribution systems are reviewed. The use of computers has facilitated this study. A program is available for balancing equivalent pipe lengths. It is feasible to consider writing a design program for a digital computer which would permit direct determination of the best combination of pipes to satisfy prescribed conditions as defined by a generalized equation. (See also W74-05006) (Knapp-USGS)
W74-05007

APPLICATIONS OF SYSTEM ANALYZERS: A SUMMARY,
Illinois Univ., Urbana. Dept. of Civil Engineering.
M. B. McPherson.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 23-44, August 1962. 11 fig, 4 tab, 48 ref.

Descriptors: *Water distribution(Applied), *Hydraulics, *Design, Analog models, Simulation analysis, Digital computers, Mathematical models, Pipelines, Public utilities, Pipe flow, Distribution systems.

The principal features, advantages, and liabilities of various devices used in calculating the hydraulic performance of water distribution system networks are outlined. With the availability of modern computing devices there is no reason for perfunctory design or arbitrary methods of analysis. A good design contains a degree of flexibility and remains a good design only so long as it is continuously reviewed, revaluated, and modified to conform with obvious departures from previous projections. The analog model is the preferred design tool for network balancing and design, and the digital computer is the preferred tool for system balancing. (See also W74-05006) (Knapp-USGS)
W74-05008

PIPE MATERIALS, COATINGS, AND JOINTS FOR WATER DISTRIBUTION SYSTEMS,
Black and Veatch, Kansas City, Mo. Dept. of Civil Engineering.
H. H. Benjes.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 45-49, August 1962. 18 ref.

Descriptors: *Water distribution(Applied), *Pipelines, *Pipes, *Design, Metal pipes, Concrete pipes, Joints(Connections), Plumbing.

Cast iron or asbestos-cement pipe is ordinarily used in the smaller sizes for distribution systems, although cement-protected steel pipe is generally used in certain cities in the West. Cast iron pipe is the most generally accepted type for small sizes because of its long satisfactory experience record, and its ease of laying and tapping. Cast iron pipe is not suitable for some locations where soil corrosion or electrolysis is detrimental to the use of unprotected metal pipe. In these locations asbestos-cement pipe may be used. In many cities the present trend is not to use cast iron or asbestos-cement for the larger mains because of the brittleness of the materials and the consequent possibility of line breaks when subjected to soil movement, settlement, or shock loads. Asbestos-cement pipe should not be used in tight soils which are subject to shrinkage with changes in moisture content. When used in these locations, the pipe should be completely embedded in granular material. Whenever possible, all materials incorporated in a water distribution system should be selected on the basis of providing reliable service for the long-time needs of the customers served. (See also W74-05006) (Knapp-USGS)
W74-05009

WATER MAIN LAYING,
Kuch and Watson, Inc., Lake Bluff, Ill.
G. T. Watson.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 50-54, August 1962.

Descriptors: *Pipes, *Pipelines, *Construction, Design, Excavation, Distribution systems, Engineering.
Identifiers: *Water main laying.

Methods for careful and proper water main installation are briefly reviewed. Four basic products are cast iron, asbestos-cement, steel, and prestressed concrete water pipe. Basic soil conditions with which to contend in water main installation are clay, loam, peat, granular material, and rock. (See also W74-05006) (Knapp-USGS)
W74-05010

TAPPING, DISINFECTION, AND INSPECTION OF WATER MAINS,
Cedar Rapids Water Works, Iowa.
R. A. Wilford.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 55-59, August 1962. 6 ref.

Descriptors: *Pipes, *Pipelines, *Construction, *Disinfection, Design, Excavation, Distribution systems, Engineering, Water treatment.
Identifiers: *Tapping(Water mains).

Inspection, disinfection, and tapping of water mains are briefly reviewed. The most important thing that an inspector must watch in laying water main is the bedding conditions for the pipe. More failures occur because of poor bedding than for any other single factor. Complete disinfection of a new water main can be obtained if the following measures are taken during and after installation: (1) keep the pipe reasonably clean while laying; (2) cover the end of the pipe after each day so that no small animals can get in; (3) allow plenty of openings so that a velocity of 2 to 3 fps can be obtained when flushing; (4) use a chlorine dosage of at least 10 ppm and allow a contact period of 24 hours; (5) flush well before and after the contact period; and (6) test before turning into service. Tapping water mains is a relatively simple operation,and the methods used for tapping have not changed a great deal for several decades. (See also W74-05006) (Knapp-USGS)
W74-05011

OBSERVING FIRE PROTECTION REQUIREMENTS IN FUTURE WATER SYSTEM DESIGN,
Illinois Inspection Bureau, Chicago.
A. H. Gent.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 60-66, August 1962. 2 tab.

Descriptors: *Water distribution(Applied), *Pipes, *Pipelines, *Cities, Distribution systems.
Identifiers: *Fire protection(Water systems).

The fire protection aspects of several features of water supply design are briefly reviewed. Fire protection reserve provides the volume and the pressure required for public fire protection and supplies private protection facilities such as automatic sprinklers and standpipe systems. This fire reserve should be sufficient to meet the fire service requirements prescribed by the National Board of Fire Underwriters. This fire demand represents a large percentage of the total in small cities, varying from about 80% or more in cities under 5,000 to about 60% in cities of 25,000 population. (See also W74-05006) (Knapp-USGS)
W74-05012

MAINTENANCE OF WATER DISTRIBUTION SYSTEMS,
Jackson Water Dept., Mich.
J. M. Rogeven.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 67-72, August 1962.

Descriptors: *Water distribution(Applied), *Pipes, *Repairing, *Maintenance, Pipelines, Distribution systems, Municipal water.

The best and most economical way to maintain a water distribution system is to have well-trained and well-paid personnel, good records, good reliable equipment, and a complete inventory of repair items. Leaks, large or small, are the most expensive and difficult maintenance jobs. There are several manufacturers of leak clamps for all of the different types of pipes and pipe joints, including a clamp which covers the entire bell. (See also W74-05006) (Knapp-USGS)
W74-05013

VALVES, HYDRANTS, AND MAIN LINE METERS,
Racine Water Dept., Wis.
G. H. Ruston.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 73-78, August 1962. 2 fig.

Descriptors: *Water distribution(Applied), *Valves, *Hydrants, *Water measurement, Instrumentation, Pipes, Distribution systems, Municipal water.
Identifiers: Water meters.

Main-line or master meters provide the means of determining total flow and are the basis for accurate accounting, chemical treatment, and to determine unaccounted water. With accurate main-line meters and accurate meters at the point of consumption, the percentage of loss can be readily determined. Valves should be located uniformly throughout the system in reference to street intersections, such as on property line, curb line, sidewalk line, etc., as these help in locating valves in emergencies. In general, hydrants should be placed with consideration of their possible use as reflected in the local hazards. Hose lines more than 400 to 500 feet long are inefficient and a source of delay. Therefore, hydrants should not be distributed more than 300 to 400 feet from the buildings to be protected. Furthermore, friction losses use up pressures available in hose lines at a rapid rate, and this factor definitely limits the length of hose lines. (See also W74-05006) (Knapp-USGS)
W74-05014

DOMESTIC SERVICE METERS,
Hersey-Sparling Meter Co., Dedham, Mass.
A. R. Moore.
In: Fourth Sanitary Engineering Conference on Water Distribution Systems, conducted by Illinois Dept of Public Health and Univ of Illinois, Feb. 13-14, 1962, Urbana: University of Illinois Bulletin, Vol 60, No 2, p 79-83, August 1962. 7 ref.

Descriptors: *Water measurement, *Instrumentation, *Water distribution(Applied), Maintenance, Distribution systems, Municipal water.
Identifiers: *Water meters.

Water meters commonly used for household, commercial, and industrial services include the positive displacement, velocity, compound, and fire line meters. Proper maintenance of water meters will pay substantial dividends. The larger meters in common use, such as 6-, 8-, and 10-inch compound or fire line meters, should be tested frequently because of the large revenue involved. (See also W74-05006) (Knapp-USGS)
W74-05015

RESERVOIR AERATION IMPROVES WATER QUALITY,
New Hampshire Water Resources Board, Concord.
D. Rapoza.
Public Works, Vol 102, No 5, p 86-87, 1971. 1 tab.

Descriptors: *Water supply, *Quality control, *Aeration, Reservoirs, Costs, New Hampshire, Destratification, Oxygenation.
Identifiers: *Greenville(N.H.), Air Aqua System.

Although New Hampshire's Greenville Reservoir was treated by flocculation, settling, rapid sand filtration, and chlorination, the water was dark from color imparted by decaying organic matter, high iron content turned laundry brown and bleaching attempts resulted in reactions with manganese, turning clothes black; in addition, there was often a strong hydrogen sulfide odor. To improve the water quality a controlled aeration system was designed to lift 150 MG of water from the bottom to the surface per day; the reservoir has a 750 MG capacity of which 213 MG is allocated for water supply. The stabilization and oxygenation effort resulted in better water quality immediately after installation of the equipment, at a cost of $8750. Shore-housed compressors pump air via a total of 4000 ft of polyethylene weighted tubing to eight individually-fed 250-ft lines of valved tubing, also of polyethylene. Air is supplied by eight 3/4-hp electric motor driven compressors. Now the town is getting excellent water in winter as well as summer. Power costs are estimated to be about $90 per month. Chemical costs before the system was installed were reduced to $39.91 per MG in August 1970. (Auen-Wisconsin)
W74-05063

SAGINAW COUNTY WATER AND WASTEWATER UTILITY MASTER PLAN.
Williams (Clyde E.) and Associates, Inc., South Bend, Ind.
For primary bibliographic entry see Field 5D.
W74-05243

INFLUENCE OF WATER INTAKE ON THE DEGREE OF INCISOR FLUOROSIS AND ON THE INCORPORATION OF FLUORIDE INTO BONES AND INCISOR TEETH OF MICE,
Institute of Dental Research, Prague (Czechoslovakia).
For primary bibliographic entry see Field 5C.
W74-05246

5G. Water Quality Control

REMOVAL OF HEAVY METALS FROM MINE DRAINAGE BY PRECIPITATION,
Denver Univ., Colo. Dept. of Chemical Engineering and Metallurgy.
For primary bibliographic entry see Field 5D.
W74-04851

DEVELOPMENT OF A METER FOR MEASUREMENT OF SEWER FLOW,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-04857

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, MADISON COUNTY, ALABAMA: WATER RESOURCES,
Geological Survey, University, Ala. Water Resources Div.
For primary bibliographic entry see Field 4B.
W74-04911

EXPRO '74--A LISTING OF EXTRAMURAL PROJECTS TO BE FUNDED IN FISCAL YEAR 1974.
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
November 1973. 274 p.

Descriptors: *Grants, *Projects, *Research and development, Pollution abatement, Water pollution control.
Identifiers: *Environmental protection agency, Pollution control.

This Environmental Protection Agency (EPA) Extramural Program information bulletin explains how to do business with the Office of Research and Development and provides a listing of tasks planned to be funded as research and demonstration projects during each fiscal year. The Office of Research and Development (OR and D) conducts and supports research, development and demonstration efforts on a wide variety of subjects primarily related to pollution sources and effects, environmental sciences and pollution control technology. OR and D also is responsible for assuring the quality control and standardization of analytical techniques for the Environmental Protection Agency as well as promoting, through technology transfer, the use of new techniques, processes, methodologies, etc., in pollution control. The purpose of this bulletin is twofold: (1) to acquaint the research and development community with general guidelines for working with the EPA's Office of Research and Development under grant or contract support, and (2) to make publicly available a list of specific grant and contract Tasks which OR and D plans to fund during the current Fiscal Year. This listing is planned to be issued at the beginning of each new fiscal year. (Knapp-USGS)
W74-04913

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1971.
Water Resources Council, Washington, D.C. Sedimentation Committee.
For primary bibliographic entry see Field 2J.
W74-04916

REASONABLE STATE REGULATION OF THE INTERSTATE TRANSFER OF PERCOLATING WATER,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 4A.
W74-04980

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-04981

OIL RECOVERY SYSTEM USING SORBENT MATERIAL,
Maloy Labs., Inc., Springfield, Va.
G. D. Gumtz, and T. P. Meloy.
Copy available from GPO Sup Doc as EP1.23:670/2-73-068, $4.00; microfiche from NTIS as PB-229 576 $1.45. Environmental Protection Agency, Technology Series Report, EPA-670/2-73-068, September 1973. 159 p, 20 fig, 6 tab. EPA Project 15080 HET, Contract 68-01-0068.

Descriptors: *Oil spills, Oil pollution, Recycling, *Foam separation, Separation techniques, *Pollution abatement, Ships, *Sorption, Capital costs, Operating costs.
Identifiers: *Oil recovery system, *Sorbents.

The feasibility of recovering oil in slicks 1mm and thicker by the use of recycled sorbents has been shown in laboratory and wave tank tests. Sorbents made of recticulated foam are broadcast on the sea, herded by a boom, picked up by a porous belt and the oil squeezed out of the sorbents by a wringer. The sorbents are then rebroadcast on the sea for further oil recovery. General equations were developed for basic sorption properties, sorbent broadcasting, sorbent herding, sorbent pickup, recovery of oil from the sorbent and for the total system. Based on the laboratory modeling and general equations, the total system concept was developed. It was concluded that one inch cube sorbent particles distributed in a shrouded rectilinear screw fed system was optimal. A 4/1 compression ratio of the slick by a boom herding the sorbent and oil to the channel would work under virtually any wave condition. Capital costs for this system are $216,500 and operating costs $59,500 per year. Economic studies made indicate that recovery cost is about 6 cents per gallon, assuming a system is used 22 days per year and a 20 year depreciation. For large spills the salvage cost of the oil could pay for the operation. The system has a nominal capacity of 5,000 gallons per hour. (EPA)
W74-04985

COMPARATIVE COSTS OF EROSION AND SEDIMENT CONTROL, CONSTRUCTION ACTIVITIES.
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 4D.
W74-04986

AESTHETICS IN ENVIRONMENTAL PLANNING.
Stanford Research Inst., Menlo Park, Calif. Operational Evaluation Dept.
For primary bibliographic entry see Field 6G.
W74-04987

WATER RESOURCES AS A BASIS FOR COMPREHENSIVE PLANNING AND DEVELOPMENT IN THE CHRISTINA RIVER BASIN,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 6B.
W74-04988

PRATTVILLE, ALABAMA, COMMUNITY DEVELOPMENT PLAN, VOLUME I: TEXT.
Central Alabama Regional Planning and Development Commission, Montgomery.
For primary bibliographic entry see Field 6B.
W74-04991

WATER MANAGEMENT,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05000

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART I: ABSTRACTS.
Florida Univ., Gainesville. Coll. of Law.
Available from the National Technical Information Service as PB-222 228-Set, for $40.00 for two parts. September 1972, 809p, OWRR W-130(9075)(1).

Descriptors: *Bibliographies, *Water pollution control, *Pollution abatement, *Regulation, Legal aspects, *Abstracts, Legislation, Water law, Judicial decisions, Jurisdiction, *Water quality control, Water quality standards.

The bibliography of 2,416 abstracts includes, but is not limited to: statutes; state administrative regulations; state judicial decisions; federal statutes; federal administrative regulations; federal judicial decisions; treaties; articles and comments in serial publications; executive orders; monographs; committee reports; congressional hearings and documents; state legislative proceedings; state documents; conference reports; attorney general opinions; interstate compacts; and treaties. All abstracts appearing in the bibliography were prepared between 1968 and 1971. A majority were prepared from materials at the time; however, some documents, particularly judicial decisions, have been included regardless of their chronological date. Moreover, much of the secondary material abstracted relates to or reviews earlier concepts and enactments. All abstracts have been categorized into one of eight subject groups: Foreign and International, Federal Legislation, Federal Regulations, Federal Judicial Decisions, State Legislation, State, Regional and Local Regulations, State Judicial Decisions, and General/Interdisciplinary Analysis. Within the major subject groups abstracts have been further categorized into 42 descriptive topics. (See also W74-05005)
W74-05004

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART II: SUBJECT INDEX.
Florida Univ., Gainesville. Coll. of Law.
Available from the National Technical Information Service as PB-222 228-Set for $40.00 for two parts. September 1972, 735p, OWRR W-130(9075)(2).

Descriptors: *Bibliographies, *Water pollution control, *Pollution abatement, *Regulation, Legal aspects, *Abstracts, Legislation, Water law, Judicial decisions, Jurisdiction, *Water quality control, Water quality standards.

The Subject Index lists the title and location number of an abstract under several terms describing its content. The majority of subject-index terms have been taken from the controlled vocabulary of the Water Resources Thesaurus (1st ed.), 1966, published by the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior. (See also W74-05004)
W74-05005

MAN'S ENVIRONMENT AND THE ATLANTIC ALLIANCE,
For primary bibliographic entry see Field 6G.
W74-05027

AERATION SYSTEM REVITALIZES LAKES.
For primary bibliographic entry see Field 5C.
W74-05060

RESERVOIR AERATION IMPROVES WATER QUALITY,
New Hampshire Water Resources Board, Concord.
For primary bibliographic entry see Field 5F.
W74-05063

CONTROL OF ALGAE BY MIXING,
New Hampshire Water Supply and Pollution Control Commission, Concord.
H. J. Turner, R. E. Towne, and T. P. Frost.
New England Water Works Association Journal, Vol 86, No 3, p 267-275, 1972. 2 fig, 12 ref.

Descriptors: *Algal control, *Destratification, *Mixing, Methodology, New Hampshire, Cyanophyta, Chlorophyta, Eutrophication.
Identifiers: *Kezar Lake(N.H.), Aphanizomenon.

Copper sulfate controlled Anabaena successfully in Kezar Lake, New Hampshire, but in 1966 it was replaced by Aphanizomenon which proved resistant to copper sulfate. The situation was sufficiently serious to affect lake-front property values, which declined so much that assessment appraisals were reduced as much as 30%. To control the nuisance algae, an economical method was chosen as simple bubbling with air. Four air compressors were installed, each driven by a 3 hp motor, on the shore with 2-inch i.d. plastic pipe leading to the deepest part of the lake (27 ft.). When the compressors were started, the algal cell count was over a million per milliliter near the surface and there was practically no oxygen near the bottom; the Secchi disc reading was 1-1/2 feet. After a month of bubbling, algal cell count dropped below 30,000 cells/ml and Secchi disc readings increased to over 3-1/2 feet. Algal crop composition changed from blue-greens to the less objectionable greens and Secchi disc readings remained in excess of four feet. Observations suggest that mixing may accelerate algal successions and that destratification may have a beneficial long-term effect on a lake. (Jones-Wisconsin)
W74-05064

EFFECT OF WATERSHED AREA OIL FIELDS ON WATER QUALITY,
Shreveport Dept. of Water and Sewerage, La.
For primary bibliographic entry see Field 5B.
W74-05079

REPORT OF THE POLLUTION COMMISSION, PART II: COLLABORATION BETWEEN THE WATER AND OIL INDUSTRIES,
For primary bibliographic entry see Field 5B.
W74-05094

GROUND WATER SUPPLIES OF NORTHEASTERN ILLINOIS -- QUALITY PROBLEMS WITH WELL WATERS,
Illinois State Water Survey, Urbana. Chemistry Section.
For primary bibliographic entry see Field 5B.
W74-05100

ABATEMENT OF MINE DRAINAGE POLLUTION BY UNDERGROUND PRECIPITATION,
Parsons (Ralph M.) Co., Los Angeles, Calif.
C. K. Stoddard.
Copy available from GPO Sup Doc as EP1.23:670/2-73-092, $1.55; microfiche from NTIS

as PB-229 407 $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-092, October 1973. 125 p, 16 fig, 8 tab, 5 ref. EPA Project 14010 EJF (No CR84). Contract WPRD-242-01 to Pennsylvania Dept. of Environmental Resources.

Descriptors: *Acid mine water, *Mine water, Neutralization, Water pollution, Flow control, *Sealants, *Coal mine wastes, *Pennsylvania, *Slurries, Lime, Pollution abatement, Mine drainage.

Laboratory tests with synthetic acid mine water show the sealing effect of the gelatinous precipitate that forms when hydrated lime or powdered limestone is added in a simulated mine entry closed by a porous barrier. Field tests were conducted in a recently abandoned coal mine. Hydrated lime and limestone slurries were pumped into the mine water behind rubble barriers through 2-inch steel pipes to test the laboratory findings. The outflow was observed at weirs attached to the ends of two 12-inch diameter drain pipes. The results indicated that only temporary sealing of the outflow was achieved and that neutralization took place when the interior water flow conditions were favorable. Placement of the injection outlets, dispersion of the lime slurry, volume of water flowing, and direction of flow in the mine interior to other outlets are important controlling variables that greatly affect the efficiency of the sealing and neutralization of the outflowing acid mine water. (EPA)
W74-05106

INTERSTATE PLANNING FOR REGIONAL WATER SUPPLY AND POLLUTION CONTROL.
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W74-05108

COMBINED SEWER OVERFLOW FOR THE HUDSON RIVER CONFERENCE,
Interstate Sanitation Commission, New York.
For primary bibliographic entry see Field 5D.
W74-05112

GENERAL ENVIRONMENTAL SITING GUIDES FOR NUCLEAR POWER PLANTS -- TOPICS AND BASES, (DRAFT).
Directorate of Regulatory Standards (AEC), Washington, D.C.
October 31, 1973. 130 p, 12 fig, 179 ref.

Descriptors: *Nuclear powerplants, *Sites, Locations, *Regulation, *Environment, *Safety, Ecology, Soils, Geology, Climatology, Hydrology, Public health, Population, *Water pollution control, Water supply.

The development of general environmental siting guides for nuclear powerplants is one of the steps being taken by the United States Atomic Energy Commission to improve the selection of environmentally acceptable sites and to shorten the overall licensing process for light-water reactors. The guides must be based on sound principles of environment management and should be a maximum use to industry and the concerned public in evaluating and improving conventional siting practices. The guides should also be of general value for assessing the desirability and practicality of advanced siting concepts such as nuclear power parks, offshore and lagoon sites for floating plants, and underground and metropolitan sites. (Houser-ORNL)
W74-05180

AEC IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT IN ITS LICENSING AND REGULATION OF NUCLEAR FACILITIES,
Division of Radiological and Environmental Protection (AEC), Washington, D.C.
L. R. Rogers, and C. L. Henderson.
In: CONF-710501-P1 -- Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 63-67. (1971).

Descriptors: *Law enforcement, *Legislation, Management, *Legal aspects, *Regulation, *Administration, Administrative agencies, *Standards, Safety, Population, Public health, Environment, Radiation, Water, Water quality, Air, Soils, Organizations.
Identifiers: *National Environmental Policy Act.

In response to growing public awareness and concern for protection of the natural environment, the federal government enacted on January 1, 1970, the most comprehensive and far reaching of the several federal statutes directed specifically toward the protection of the environment. The statute is known as the National Environmental Policy Act of 1969, or NEPA. Broadly speaking, the Act makes it the continuing responsibility of the federal government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate federal plans, functions, programs, and resources toward certain stated ends of environmental protection. An AEC policy statement for implementing NEPA is discussed. One of the underlying themes in the new policy statement is that the preservation of environmental values can best be accomplished through the establishment of environmental quality standards and requirements by appropriate federal, state, and regional agencies having responsibility for environmental protection, and the AEC urges that these agencies proceed promptly to establish such standards. A draft of 'Guide to the Preparation of Environmental Reports for Nuclear Power Plants' has been prepared and issued for comment and interim use. (See also W74-05181) (Houser-ORNL)
W74-05186

RIVERBANKS IMPROVEMENT PROGRAM,
Broome County Planning Dept., Binghampton, N.Y.
For primary bibliographic entry see Field 6F.
W74-05234

SLOW RELEASING NITROGEN FERTILIZER FROM THE WASTE PRODUCT, LIGNIN SULPHONATES,
Forschungsanstalt fuer Landwirtschaft, Brunswick (West Germany). Institut fuer Biochemie des Bodens.
For primary bibliographic entry see Field 5B.
W74-05249

NEW MEASURING METHODS FOR EVALUATING WASTE WATER QUALITY (NEUERE MESSVERFAHREN ZUR BEURTEILUNG DER ABWASSERQUALITAET),
Herzberger Papierfabrik Ludwig Osthushenrich K.G., Herzberg am Harz (West Germany).
For primary bibliographic entry see Field 5A.
W74-05259

SURVEY OF RESIDUAL WASTE WATER TREATMENT (UEBERBLICK UEBER DIE BEHANDLUNG DER RESTABWAESSER),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungesstelle.
For primary bibliographic entry see Field 5D.
W74-05261

ECONOMIC IMPACT OF POLLUTION ABATEMENT ON THE SULFITE SEGMENT OF THE U.S. PULP AND PAPER INDUSTRY,
Little (Arthur D.), Inc., Cambridge, Mass.
For primary bibliographic entry see Field 5D.
W74-05277

AGRICULTURAL POLLUTION CONTROL AND ENFORCEMENT IN NEW YORK STATE,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5B.
W74-05285

RELIABILITY AND ECONOMIC OPTIMIZATION FOR URBAN RETURN FLOWS MANAGEMENT,
Texas Univ., San Antonio. Div. of Environmental Studies.
For primary bibliographic entry see Field 5B.
W74-05333

PRELIMINARY LABORATORY TESTS FOR THE CONTROL OF ALGAE IN RICE FIELDS (IN ITALIAN),
Milan Univ. (Italy). Istituto di Patologia Vegetale.
For primary bibliographic entry see Field 5C.
W74-05357

THE USE OF MINERAL FERTILIZERS IN IRRIGATION WITH PURE WATER, SEWAGE AND LIQUID MANURE, (IN RUSSIAN),
Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Leipzig (East Germany). Institut fuer Mineraldueng.
For primary bibliographic entry see Field 3F.
W74-05371

APPLICATION OF MULTIGOAL WATER QUALITY PLANNING MODEL,
Krannert Graduate School of Industrial Administration Administration, Lafayette, Ind.
For primary bibliographic entry see Field 5D.
W74-05384

SYSTEMS ANALYSIS FOR ENVIRONMENTAL POLLUTION CONTROL,
Michigan Univ., Ann Arbor. School of Public Health.
R. A. Deininger.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, p 3-18 (Introduction), 1973. 88 ref.

Descriptors: *Systems analysis, *Mathematical models, *Environmental control, *Water pollution control, *Pollution abatement, Solid wastes, Disposal, Air pollution, Optimization, Simulation analysis, Stochastic processes, Digital computers.

In this introductory chapter, Deininger discusses the use of systems analysis and mathematical modeling for formulating and solving problems of environmental pollution. He defines the systems approach and considers seven standard steps in a systems analysis study. They include: (1) problem formulation; (2) model construction; (3) definition of criterion function; (4) data collection; (5) derivation of optimal solutions; (6) model, solution, and sensitivity testing; and (7) implementation of the best solution. Next, Deininger acknowledges the techniques and tools of systems analysis, i.e., optimization; linear, non-linear, and dynamic programming; stochastic and integer programming; queueing theory; simulation and network techniques; PERT, CPM; gradient techniques; and digital computers. This paper then examines water pollution problems--with special attention paid to the historic development of the use of systems analysis--then solid waste disposal problems, and then air pollution problems. Finally, Deininger looks at total and global environmental models and summarizes current modeling efforts. (Bell-Cornell)
W74-05387

A REGIONAL PLANNING MODEL FOR WATER QUALITY CONTROL,
Purdue Univ., Lafayette, Ind., Dept. of Economics.

For primary bibliographic entry see Field 5B.
W74-05390

INTRODUCTION TO SIMULATION TECHNIQUES,
California Univ., Davis. Dept. of Civil Engineering.
G. T. Orlob.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 91-105 (Chapter 4), 1973. 5 fig, 10 equ, 11 ref.

Descriptors: *Simulation analysis, *Aquatic environment, *Water pollution control, *Planning, *Methodology, River basins, Estuaries, Reservoirs, Mathematical models, Hydrology, Systems analysis.

A basic approach to simulation of the aquatic environment that has proven to be practical in pollution control planning is outlined in detail. There are three fundamental steps in model design: conceptual, functional, and computational representation. A discussion of the first two steps serves to illustrate the model development procedure, the third step being out of the scope of this paper. Under conceptual representation, determining model scale and discretizing the system are considered. Within the functional representation, advection-diffusion equations, the effects of scale, mass conservation equations, and motion and continuity are discussed. (Computational representation includes selecting a solution technique and forming input and output.) Included as illustrative examples in this simulation study are the Texas Water Plan, model idealization of a river basin, conceptual representation of a reservoir, and the San Francisco Bay-Delta estuarial mathematical model network, including a definition sketch--WRE node-link estuarial model. Following this approach, useful models have been developed for many classes of problems and are now being applied in planning studies in the United States. Among those that may be cited are models for: stream water quality; reservoir temperature; estuarial hydrodynamics and quality; groundwater quality; and aquatic ecology. (Bell-Cornell)
W74-05391

TOTAL ENVIRONMENTAL QUALITY MANAGEMENT MODELS,
Resources for the Future, Inc., Washington, D.C.
W. O. Spofford, Jr.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 403-436 (Chapter 19), 1973. 2 fig, 1 tab, 36 equ, 49 ref.

Descriptors: Environment, *Quality control, *Management, *Model studies, *Water quality, *Wastes, Air pollution, Waste disposal, Regions, Systems analysis, Optimization, Simulation analysis.
Identifiers: Residuals management, *Environmental quality, Nonlinear programming.

The effort to integrate models of air and water pollution and solid waste disposal into an overall environmental quality model is described. The term 'total environmental quality management models' is defined as meaning 'regional residuals-environmental quality management models,' where these include only the impacts on environmental quality of residuals discharges to the air, water, and land environments. The term 'residual' is preferred here to that of 'waste.' The entire regional residuals management system is delineated, including the range of management options available to society for improving environmental quality; indicated is how all the system components may be expressed and ultimately linked together within the same computational framework. The residuals management model is discussed qualitatively and then formulated quantitatively; mathematical forms of the various environmental models are discussed, and computational schemes for selecting an optimal management strategy are suggested. Included are: residuals generation and discharge models; environmental modification and environmental quality models; a management model formulation and a procedure for optimizing a nonlinear objective function subject to a set of linear constraints; an atmospheric dispersion model; an aquatic ecosystem model; and more optimization procedures, including a heuristic approach. The regional residuals management model suggested herein is more complex than the classical management model approach, and it requires a substantial amount of computer resources. (Bell-Cornell)
W74-05398

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE APPLICATION OF BINARY TREE STRUCTURES TO HYDROLOGIC NETWORK SIMULATORS,
Nebraska Univ., Lincoln. Dept. of Computer Science.
For primary bibliographic entry see Field 4A.
W74-04852

OPTIMIZATION OF OPERATION OF A SYSTEM OF FLOOD CONTROL RESERVOIRS,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-04858

COMPUTER SIMULATION OF THE HYDROLOGIC AND SALINITY FLOW SYSTEMS WITHIN THE BEAR RIVER BASIN,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5B.
W74-04860

A STOCHASTIC SNOW MODEL TO EVALUATE RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 4A.
W74-04918

ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE--SUMMARY OF EIGHTH MEETING, JUNE 5-7, 1973, PORTLAND OREGON.
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 7C.
W74-04924

THE DEVELOPMENT AND FIELD TESTING OF A BASIN HYDROLOGY SIMULATOR,
Kansas Univ., Lawrence. Dept. of Chemical and Petroleum Engineering.
For primary bibliographic entry see Field 2A.
W74-04984

WATER RESOURCES AS A BASIS FOR COMPREHENSIVE PLANNING AND DEVELOPMENT IN THE CHRISTINA RIVER BASIN,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 6B.
W74-04988

PLANNING FOR THE ULTIMATE HYDRAULIC DEVELOPMENT OF THE NILE VALLEY,
For primary bibliographic entry see Field 4A.
W74-04997

ECONOMETRIC MODEL FOR RIVER BASIN PLANNING,
For primary bibliographic entry see Field 4A.
W74-04999

OPTIMAL STATE ANALYSIS OF RESERVOIRS,
California Univ., Los Angeles. School of Engineering and Applied Sciences.
W. W-G. Yeh, L. Becker, W. J. Trott, G. W. Tauxe, and L. F. Hancock.
Report UCLA-ENG-7390, November 1973. 75 p, 2 fig, 2 tab, 17 ref, 2 append. USDI Contract 14-06-200-5882A.

Descriptors: *Reservoir operation, *Optimization, Dynamic programming, California, Linear programming, Least squares method, Streamflow forecasting, Bibliographies, Abstracts, Systems analysis, Water management(Applied).
Identifiers: *California Central Valley Project.

Dynamic programming was studied for use in selection of an optimal reservoir storage policy path through a specified number of policy periods, and linear programming for use in period by period optimization. The policy periods, in case of the real time operation, correspond to the number of time periods for which a streamflow prediction model is reasonably reliable. The method results in relatively easy computer implementation and high flexibility, in that changes in constraints are simply made and additional reservoirs easily added. The method is useful for the determination of release policies in real time operation of an existing system. The methods are demonstrated in a real system of reservoirs and hydroelectric facilities associated with the Shasta, Trinity and Folsom subsystems of the California Central Valley Project. The two-stage least squares estimation method gives unbiased estimators when the system is described by a set of simultaneous equations in which each equation contains several dependent variables, which also occur in other equations. In Shasta and Clair Engle reservoirs California, the dependent variables are the February to July inflows while the independent variables include snow-water contents and precipitation indices at several stations within the two watersheds. An annotated bibliography was compiled of the available practical techniques for considering the adverse effects of daily and weekly operations on the risk of not meeting firm water and power commitments at some future date. (Knapp-USGS)
W74-05167

SYSTEMS ANALYSIS: A DECISION-MAKING TOOL FOR ARID LAND DEVELOPMENT,
Arizona Univ., Tucson. Dept. of Watershed Management.
M. M. Fogel.
In: Agricultural Aspects of Arid and Semi-arid Zones, CENTRO seminar, 1972, p 268-277. 2 tab.

Descriptors: *Land development, *Decision making, *Operations research, *Systems analysis, *Arid lands, Agriculture, Land management, Land use, Management, Planning, Alternate planning, Optimization, Risks, Scheduling, Simulation analysis, Hydrologic systems, Model studies.

Arid land development is an integral part of water resources development planning, entailing the selection of certain alternate procedures in light of a given set of parameters. The selection process may be facilitated by using operations research, systems analysis or decision analysis as a tool. Examples of such use are illustrated by a watershed problem, where plans to induce runoff need to be studied for their effects, and an agricultural problem with irrigation scheduling constraints. The techniques involved are still relatively new, leaving to the ingenuity of the planner a key part of the decision process. The systems analyst makes the decision-making process easier by showing the

;sults of each alternative choice as it relates to ie solution of the given problem and to yproducts of the decision. (Muller-Arizona)
'74-05223

ELIABILITY AND ECONOMIC OPTIMIZA-ION FOR URBAN RETURN FLOWS ANAGEMENT,
exas Univ., San Antonio. Div. of Environmental udies.
or primary bibliographic entry see Field 5B.
'74-05333

QUIVALENT PIPE METHODS FOR OPTIMIZ-G WATER NETWORKS--FACTS AND FAL-ACIES,
oorkee Univ. (India).
or primary bibliographic entry see Field 8A.
'74-05383

PPLICATION OF MULTIGOAL WATER UALITY PLANNING MODEL,
rannert Graduate School of Industrial Adminis-ation Administration, Lafayette, Ind.
or primary bibliographic entry see Field 5D.
'74-05384

HE ECONOMIC EFFICIENCY OF INTER-ASIN AGRICULTURAL WATER TRANSFERS UTAH: A MATHEMATICAL PRO-RAMMING APPROACH,
ater Research Lab., Logan.
or primary bibliographic entry see Field 4A.
'74-05385

ODELS FOR ENVIRONMENTAL POLLU-ION CONTROL.
ichigan Univ., Ann Arbor. School of Public ealth.
or primary bibliographic entry see Field 5B.
74-05386

YSTEMS ANALYSIS FOR ENVIRONMENTAL OLLUTION CONTROL,
ichigan Univ., Ann Arbor. School of Public ealth.
or primary bibliographic entry see Field 5G.
74-05387

EGIONAL WASTEWATER MANAGEMENT YSTEMS,
arlsruhe Univ. (West Germany). Institut fuer edlungswasserwirtschaft.
or primary bibliographic entry see Field 5D.
74-05389

REGIONAL PLANNING MODEL FOR ATER QUALITY CONTROL,
rdue Univ., Lafayette, Ind., Dept. of conomics.
or primary bibliographic entry see Field 5B.
74-05390

TRODUCTION TO SIMULATION ECHNIQUES,
lifornia Univ., Davis. Dept. of Civil Engineer-;.
r primary bibliographic entry see Field 5G.
74-05391

ATHEMATICAL MODEL FOR OXYGEN ALANCE IN RIVERS,
ciete Grenobloise d'Etude et d'Applications drauliques (France).
r primary bibliographic entry see Field 5B.
74-05392

WATER QUALITY MODELS AND AQUATIC ECOSYSTEMS STATUS, PROBLEMS AND PERSPECTIVES,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5B.
W74-05393

MODELS OF WATER SUPPLY SYSTEMS,
Karlsruhe Univ. (West Germany). Institut fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 4A.
W74-05394

AN ECONOMIC APPRAISAL OF CHANGES IN WATER USE THROUGH INVESTMENTS IN NAVIGABLE RIVERS AND CANALS,
Kocks (F. H.), Duesseldorf (West Germany).
W. Schmid, G. Kuhlmann, and J. Muhlbauer.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 181-196 (Chapter 8), 1973. 4 fig, 3 tab.

Descriptors: Water resources development, *Water users, *Weirs, *Canals, Construction, *Cost-benefit analysis, *Simulation analysis, *Water supply, Rivers, Reservoirs, Water quantity, Water quality, Navigation, Computer programs, Investment, Pricing, Mathematical models, Systems analysis.
Identifiers: *Economic analysis, Receiving water capacity.

An approach is presented for determining the net benefits accruing to urban, industrial, and agricultural water users from the construction of weirs and canals for navigation purposes. Included is an economic appraisal of changes in water use caused by such investment. Canals and weirs influence the water supply and receiving water capacity of a channel-reservoir system; the major consequences of such construction are alterations of water supply in quantitative and in qualitative terms and an alteration of the receiving water capacity. These alterations affect water utilization (except when they occur within the range of excessive quantity or quality) and are economically relevant in the form of costs and benefits. The approach presented combines cost-benefit analysis and a five-element simulation model to derive the physical benefits accruing to water users. On the basis of this model, a computer program was developed that was tested for two sections of the German system of domestic waterways. The next step is to develop a general model for transforming the net benefits in physical terms into net monetary benefits. Thus far, only the basic pricing concept has been developed, which is based upon an opportunity cost approach. (Bell-Cornell)
W74-05395

WATER RESOURCES MANAGEMENT,
Ecole Nationale Superieure des Mines de Paris (France).
For primary bibliographic entry see Field 6B.
W74-05396

MATHEMATICAL APPROACH TO WATER RESOURCES MANAGEMENT IN ITALY,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
M. Benedini.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 205-215 (Chapter 10), 1973.

Descriptors: Water resources development, *Management, *Water supply, *Hydroelectric power, *Simulation analysis, *Irrigation, *Water demand, *Water quality control, *Reservoirs, Seasonal, Dams, Downstream, Reach(Streams), Flow, Optimization, Mathematical models, Systems analysis.
Identifiers: *Italy(Tiber River).

The principle aspects of water resources management in Italy are discussed, and simulation and optimization techniques applied to existing problems are described; there is an increasing demand (in the face of scarce supplies) for domestic, irrigation, and industrial water, with the need for increasing the individual income. Needed also are large treatment plants for the reuse of wastewaters. But management of Italian water resources now consists mainly of settling conflicts between existing uses, rather than planning new hydraulic works. Hydroelectric power production suffers from limitations imposed by flood control needs. Described is a simulation model, based on a continuity equation, which can be used with both historical and synthetic hydrological input, as well as in a deterministic and probabilistic manner. Difficulties of mathematical and economic evaluation of water uses in Italy are considered. Problems of irrigation water demand, water supply, pollution, and water quality are discussed, considering the application of optimization and simulation modeling. Finally, the work of the 'Istituto di Ricerca sulle Acque' in developing methodologies for studying integrated utilization of the resources in a large catchment area is reported. The area chosen for study was that of the Tiber River. (Bell-Cornell)
W74-05397

TOTAL ENVIRONMENTAL QUALITY MANAGEMENT MODELS,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05398

6B. Evaluation Process

THE IDENTIFICATION AND QUANTIFICATION OF THE NET EFFECTS OF MULTIPLE-PURPOSE RIVER BASIN DEVELOPMENT,
Georgia Univ., Athens. Inst. of Natural Resources.
For primary bibliographic entry see Field 4A.
W74-04854

THE HUMAN ECOLOGICAL IMPACT OF STRUCTURAL FLOOD CONTROL ON THE IOWA RIVER, IOWA,
Iowa Univ., Iowa City. Inst. of Urban and Rural Research.
For primary bibliographic entry see Field 8A.
W74-04856

WATER QUALITY IN ALASKAN CAMPGROUNDS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W74-04974

AESTHETICS IN ENVIRONMENTAL PLANNING.
Stanford Research Inst., Menlo Park, Calif. Operational Evaluation Dept.
For primary bibliographic entry see Field 6G.
W74-04987

WATER RESOURCES AS A BASIS FOR COMPREHENSIVE PLANNING AND DEVELOPMENT IN THE CHRISTINA RIVER BASIN,
Delaware Univ., Newark. Water Resources Center.
J. Tourbier.
Available from the National Technical Information Service as PB-228 853, $13.75 in paper copy, $1.45 in microfiche. Final Report. April 1973. 199 p, 34 fig, 5 append. OWRR C-2185(3382) (1).

Descriptors: *Comprehensive planning, Water resources development, *Model studies, *Land use, *Urban hydrology, Surface waters, Subsur-

face waters, Percolation, Permeability, Urbanization, Land classification, *Delaware, Systems analysis, Planning.
Identifiers: Urban water resources protection, *Christina River Basin(Delaware), *Environmental protection measures, Land use policy, Non-point source pollution.

The Christina River Basin near Wilmington, Delaware was used as a model area to determine methods that could be used by the public sector through its planning and regulatory powers to first assess the impact of land development upon water resources and certain hydrologic phenomena and then to create a responsive land use policy and program. The impact of urban development on the natural pattern of water flow is a function of 2 sets of variables, the natural characteristics of the land and the type and intensity of development. Land areas were classified into categories called site classes on the basis of the properties that influenced the water regimen. Land uses were described in terms of their water-related impact. A computer program then related environmental protection measures, measures that can be incorporated into development while it proceeds, to the variables of site class and land use intensity. The cost distribution of these measures was used to evaluate regional land use policies and to indicate areas of natural resources limitations to development, to allow for guidance of land uses to areas where they would do the least damage. The program is heavily reliant on protection measures and their cost as an indication of problem areas. The selection of measures requires an assessment of the impact of land uses on hydrologic processes, a definition of levels of quality to be achieved, and the quantification of amelioration measures. The costing of protection measures requires specifications for construction. (Hoffman-North Carolina)
W74-04988

NORTH CAROLINA WATER PLAN-PROGRESS REPORT-CHAPTER 22, WATER BASED RECREATION.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Office of Water and Air Resources.
Draft. April 1973. 182 p, 8 fig, 36 tab, 182 ref, 4 append. Title III PL 89-80. Water Res. Plan. Act 1965.

Descriptors: Recreation, *Recreational demand, *Recreation facilities, *Water demand, *North Carolina, Water sports, Bodies of water, Economics, Land use, Natural resources, Water management, Reservoirs, Lakes, Environment, Water resources, Model studies, Rivers.
Identifiers: *Leisure, Recreation resource base, Simulation.

Demand for outdoor recreational facilities is increasing due to higher family income, increased mobility, leisure time, and population. North Carolina, with its varied water resources, provides recreational opportunities. A North Carolina comprehensive outdoor recreation plan recommends providing outdoor opportunities, preserving recreational areas, and achieving these functions in the best way. Recreational demand is concentrated primarily along the Piedmont Crescent. While an adequate recreational resource base is needed, distribution of bases in relation to population centers is also needed, as is quality of the base and time period when the resource is used. This study attempts to simulate visitation patterns around major lakes and reservoirs. It is estimated that 70% of visitors are from North Carolina. It also found that some areas with high recreational demand have few recreational opportunities. Federal attempts in recreational development, such as the National Park System, are discussed, as are lakeshore development, economic consideration, and other related topics. Recommendations presented include increasing public access to recreational areas, preserving natural resources, and balancing water-based recreational planning. Tables detailing recreational areas, (i.e. inland water bodies, farm ponds, fishing streams, coastal beaches) a description of simulation model utilized and a brief description of federal programs concerned with recreation are in the appendices. (Grden-North Carolina)
W74-04990

PRATTVILLE, ALABAMA, COMMUNITY DEVELOPMENT PLAN, VOLUME I: TEXT.
Central Alabama Regional Planning and Development Commission, Montgomery.
Final report. June, 1973. 250 p, 59 tab, 2 append. ALA-RX09-1020-0.

Descriptors: *Comprehensive planning, *Water management(Applied), *Drainage programs, *Water supply, Sewage, *Sewage treatment, Programs, Water, Water pollution control, Environmental effects, Channel improvement, *Alabama, *Community development.
Identifiers: Prattville(Ala.), Augusta Creek(Ala.), Alabama River.

Between 1963 and 1973 the population of Prattville grew by 98%. This growth is expected to continue, although at a declining rate of 5% per year. The comprehensive community development plan was undertaken to provide a framework for the future development of the Prattville urban community systems of land use, streets and highways, community utilities, community facilities, and public improvements. Recommendations are based upon interrelationships between subsystems of these systems. It is recommended that Prattville continue to draw upon underground wells for its drinking water supply. The water is of good quality; pollution of ground water supplies should not be a problem due to their depth and the natural purification from percolation. The storm drainage plan, based on 25 year storm data, proposes to utilize natural drainage courses, which to ensure continuation of natural stream life, will not be lined with concrete. A mandatory land dedication policy for drainageways also proposed. Sewage treatment capacity, under the plan, will be increased, not only to provide secondary treatment but also to eliminate the overflow of raw sewage presently being discharged into Augusta Creek. An interim plan for water pollution control abatement in Augusta Creek and the Alabama River is included. (Hoffman-North Carolina)
W74-04991

STATUS OF STATE COASTAL ZONE MANAGEMENT EFFORTS.
National Oceanic and Atmospheric Administration, Washington, D.C. Coastal Zone Management Task Force.
For primary bibliographic entry see Field 2L.
W74-04995

ECONOMETRIC MODEL FOR RIVER BASIN PLANNING,
For primary bibliographic entry see Field 4A.
W74-04999

WATER MANAGEMENT,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05000

THE ZUIDERZEE WORKS WITHIN THE FRAME OF PHYSICAL PLANNING,
Netherlands Universities Foundation for International Co-Operation, The Hague.
For primary bibliographic entry see Field 4A.
W74-05001

RECREATION IN THE OPEN AIR,
Netherlands Universities Foundation for International Co-Operation, The Hague.
P. Loos.
Planning and Development in the Netherland Vol 4, No 1, p 107-122, 1970. 3 fig, 2 tab, 5 photos

Descriptors: *Land reclamation, *Reclamatio Recreation, Land use, *Dikes, *Recreation faci ties, Soil environment, Beaches, Soil type Vegetation establishment, Soil structure, Wat policy, Landscaping, Soil management, La management.
Identifiers: *Netherlands(Ijsselmeer polder *Oostelijk Flevoland(Neth), Polders, Aquat sports areas, Sojourn accomodations, Nature te rains, Open space, Oecological Reserve.

Recreation is an important component of the w of life in the Netherlands due to a rise in prospe ty, shorter working hours, an increase of autom bile use, and higher education levels. A recreati plan for Oostelijk Flevoland, a polder reclaim from the sea, is based upon dike delineation, lan scape design, recreational needs, and soil type This plan includes aquatic sports areas, shores a beaches, woods, planted areas, nature terrair sojourn accommodations, and special points of traction. A chain of border lakes has been creat between the polders and the mainland offeri many aquatic sports. Beaches have be developed along the dikes, together with sewerage system to keep the water clean. Plant and wooded areas integrate agricultural a recreational areas. Meadow bird reserves, whe the ground water has been artifically raised, fis ing places, and the Oecological Reserve for stud ing the natural succession of plant and animal l have been created. Other special attractions clude an agricultural exhibition, game parks f hoofed animals, and a museum depicting the his ry of land reclamation in the Netherlands. W this recreation plan, the Oostelijk Flevoland hop to enhance the Dutch way of life. (Grden-No Carolina)
W74-05003

CALIFORNIA UNDERSEA AQUEDU RECONNAISSANCE: THE OCEANOGRAP (CUARO),
Naval Undersea Center, San Diego, Calif.
R. H. Riffenburgh.
Available from NTIS as AD-768 730, $5.75 paper copy. Report No NUC TP 353, August 19 158 p, 41 fig, 10 tab, 36 ref.

Descriptors: California, *Aqueducts, Underwat Waves(Water), Surges, Tsunamis, Densi Coastal engineering, Freshwater, Oceanography Identifiers: California Undersea Aqueduct.

The possibility is discussed of conveying fr water from northern to southern California vi subsurface offshore aqueduct (The California U dersea Aqueduct). The specific region investiga was between Crescent City and San Diego fr the 20- to 200-m depth contour. Available data relevant variables were analyzed to provide inf mation for aqueduct planning decisions. The va bles and analyses most influential in planning California Undersea Aqueduct were divided in two categories: variables influencing the 100-y survival of the aqueduct (century risks) and va bles influencing the construction and maintenan of the aqueduct. Waves, surges, tsunamis, den ty, and light do not appear on the basis of rec naissance data to pose insurmountable proble Surface, water column, and bottom currents, cluding upwelling and internal wave phenome may or may not be prohibitive; data are adequate, and additional information must be tained from in situ observations. Canyons are an insurmountable threat, but will pose innovat engineering challenges and probably be quite pensive. Additional data will also be required these processes. (Sinha - OEIS)
W74-05040

NTERSTATE PLANNING FOR REGIONAL VATER SUPPLY AND POLLUTION CONTROL.
Veston (Roy F.), Inc., West Chester, Pa.
or primary bibliographic entry see Field 5D.
/74-05108

CONOMIC, SOCIAL AND ENVIRONMENTAL MPACTS OF PUBLIC WORKS, VOL. I PITTBURGH AREA STUDIES, VOL. II. THE LEGHENY COUNTY SANITARY AUTHORITY ALCOSAN) FACILITY, VOL. III. IMPACT NALYSIS,
ittsburgh Univ., Pa. Environmental Engineering rogram.
. L. Garrison, R. Brumbaugh, B. Hillegas, and . Rowe.
merican Society of Civil Engineers, New York, ew York, August 1972. 226 p, 24 fig, 38 tab, 336 f. NSF: GI-29980.

escriptors: *Project post-evaluation, *Social imact, *Economic impact, *Sewerage, *Waste ater disposal, *Civil engineering, Sewage disricts, Urban sociology, Methodology, Assessents, Evaluation, History, Forecasting, Project anning, Project benefits.
dentifiers: *Impact analysis, *Impact statements.

he development and operations were studied of ie Allegheny County Sanitary Authority which ovides sewerage and sewage disposal services r 72 communities in Allegheny County, Pennsylania. The purpose was to identify and assess the cial, economic and physical impacts attributable the program and facilities of the Authority from ie date of its inception. The overall objective was develop study methods and techniques for imact analysis of various kinds of civil engineering rograms and projects. This study was one part of research project of the American Society of Civil ngineers titled 'Impact of Civil Engineering Proicts on People and Nature'. The ASCE research oject involved several studies all of which were ocused on the development of a methodology for pact analysis. The ultimate usefulness of the sults of this and subsequent studies that are anned by the ASCE will be in predicting the obable impacts of proposed civil engineering ojects prior to their final design, construction d implementation. Recommendations are given r making additional studies of the Sanitary uthority. Other completed civil engineering proicts located in the Pittsburgh area, and thought to good subjects for impact study, are identified. general discussion of impact analysis and study ethodologies is included. (Poertner)
'74-05231

EVELOPMENT OF WATER FACILITIES--ROOME COUNTY, 1967-2017.
artin (R. J.) and V. O. Shumaker-Joint Venture, estal, N.Y.
ounty of Broome, New York, 1967. 11 p, 2 fig, 1 b. CPWS-8.

escriptors: *Water supply, *Long-term planning, Vater districts, *New York, *Local governents, Public utility districts, Public benefits, ater rates, Regional development.
entifiers: *Broome County(New York).

ie 43 existing separate public water systems in e County should be consolidated into one Partounty Water District. The single district would corporate the water systems of the City of nghamton, the Villages of Endicott and Johnson ty, and the Towns of Binghamton, Chenango, nklin, Dickinson, Fenton, Kirkwood, Maine, nion, Vestal, and Windsor. The general outline the proposed district is shown. The forming of e water agency would eliminate all of the weaksses that abound when there are 43 neighboring stems going their separate ways. The 43 systems w have available as much water as will be eded in 2017. While the cost of almost erything will multiply, the cost of water in 2017 need be no higher than it was in 1967. The establishment of a single water agency would save time, money, man-power, machines and materials plus intergovernmental paper-work and delay for all concerned. Every consumer in the new water union would immediately achieve fair and equal status. The person in dire need of water would be spared the long and arduous process of petition and public hearing before his town board. In some existing cases, even more time is lost because the town board has to petition a second municipality to provide water service. A description of the proposed water agency, customer charges, and a listing of advantages and specific recommendations are included. (Poertner)
W74-05232

SEWERAGE FEASIBILITY STUDY, BROOME COUNTY, NEW YORK, SUMMARY, CONCLUSIONS AND RECOMMENDATIONS.
Clinton Bogert Associates, Fort Lee, N.J.
For primary bibliographic entry see Field 5D.
W74-05233

SEWAGE COLLECTION AND TREATMENT SYSTEMS: ISSUES IN AND APPROACHES TO IMPACT ANALYSIS,
Pittsburgh Univ., Pa. Environmental Engineering Program.
W. L. Garrison, R. Brumbaugh, B. Hillegas, and M. Rowe.
American Society of Civil Engineers, New York, New York, August 1972. 38 p, 13 fig, 4 ref. NSF Grant no. GI-29980.

Descriptors: *Project post evaluation, *Civil engineering, *Social impact, *Economic impact, *Sewerage, *Sewage districts, Urban sociology, Methodology, Waste water disposal, Assessments, Pennsylvania.
Identifiers: *Impact analysis, Pittsburgh.

An overview is given of the principal issues encountered during a study of the impacts of the regional sewage collection and treatment system serving the Greater Pittsburgh Area. This study was one part of a research project of the American Society of Civil Engineers titled 'Impact of Civil Engineering Projects on People and Nature'. The purpose of the ASCE study was to identify and study the impacts of several real-world civil engineering projects and programs. The ASCE envisions that, through subsequent planned studies, a methodology can be developed that will aid planners, designers and public officials to predict the probable impacts of civil engineering projects and programs far in advance of development and implementation. The subject of this report is the Allegheny County Sanitary Authority which serves about 1.2 million people in Allegheny County, Pennsylvania. The approaches used and the issues that guided the study and emerged from the study are discussed. The various impacts investigated included upstream impacts, downstream impacts and treatment plant impacts. Investigations undertaken included study of social, economic, political and physical impacts attributable to the development and operation of the Allegheny County Sanitary Authority. Additional studies are needed to identify and analyze the impacts of the Authority to aid in the development of study methodology for analyzing impacts of other types of civil engineering projects. (Poertner)
W74-05241

ECONOMIC ASPECTS OF A NUCLEAR DESALINATION AGRO-INDUSTRIAL PROJECT IN THE UNITED ARAB REPUBLIC,
New York State Coll. of Agricultural and Life Sciences, Ithaca. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3A.
W74-05382

AN ECONOMIC APPRAISAL OF CHANGES IN WATER USE THROUGH INVESTMENTS IN NAVIGABLE RIVERS AND CANALS,
Kocks (F. H.), Duesseldorf (West Germany).
For primary bibliographic entry see Field 6A.
W74-05395

WATER RESOURCES MANAGEMENT,
Ecole Nationale Superieure des Mines de Paris (France).
Y. Emsellem.
In: Models for Environmental Pollution Control (Ed. by R. A. Deininger), Ann Arbor Science Publishers, Inc., Ann Arbor, Mich., p 197-204 (Chapter 9), 1973.

Descriptors: Water resources development, *Management, *Water supply, Methodology, *Regional analysis, *Comprehensive planning, *Political aspects, Social aspects, Hydrologic aspects, Economics, *River basin development, Cost-benefit analysis, Simulation analysis, Forecasting, Agriculture, Mathematical models, Systems analysis.
Identifiers: *France.

An approach to water resources management is presented which abandons traditional mathematical programming with a unique objective function for a more highly comprehensive procedure. The complete hydrological basin from the source to the sea should be accepted as the basic geographical unit since it is usually an administrative and political unit. When a basin water supply manager hears that water is needed to irrigate an additional million acres, the question is not how to minimize the cost and optimize the benefit, but rather, politically-based, why another million acres should be irrigated. Possible answers are: to produce agricultural goods for domestic consumption; (2) to sell these products abroad; or (3) to create a need for labor. The distribution of charges between activity and group is different from one case to another. The inadequacy of cost-benefit analysis is discussed. A methodology for river basin development being used in France is described. A basic principle is that future water needs depend on the perspectives of regional development (determining economic and social perspectives on the basis of optimum valorization of water resources is possible only when water is scarce, as in arid zones). Four phases of the methodology are distinguished: (1) hypothesis for basin development; (2) forecast model; (3) simulation model; and (4) finance model (evaluates overall cost of each of the preceding solutions). (Bell-Cornell)
W74-05396

MATHEMATICAL APPROACH TO WATER RESOURCES MANAGEMENT IN ITALY,
Consiglio Nazionale delle Ricerche, Rome (Italy). Inst. for Water Research.
For primary bibliographic entry see Field 6A.
W74-05397

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

OIL RECOVERY SYSTEM USING SORBENT MATERIAL,
Maloy Labs., Inc., Springfield, Va.
For primary bibliographic entry see Field 5G.
W74-04985

COMPARATIVE COSTS OF EROSION AND SEDIMENT CONTROL, CONSTRUCTION ACTIVITIES.
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 4D.
W74-04986

WELL COST ANALYSIS,
National Water Well Association, Houston, Tex. Research Facility.
For primary bibliographic entry see Field 8B.
W74-05091

AIR FLOTATION-BIOLOGICAL OXIDATION OF SYNTHETIC RUBBER AND LATEX WASTE-WATER,
Firestone Synthetic Rubber and Latex Co., Lake Charles, La.
For primary bibliographic entry see Field 5D.
W74-05105

HOW MUCH WILL CLEANUP COST,
For primary bibliographic entry see Field 5D.
W74-05268

A MATHEMATICAL MODEL FOR OPTIMIZING THE DESIGN OF REVERSE OSMOSIS SYSTEMS,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 5D.
W74-05276

6D. Water Demand

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, MADISON COUNTY, ALABAMA: WATER RESOURCES,
Geological Survey, University, Ala. Water Resources Div.
For primary bibliographic entry see Field 4B.
W74-04911

WATER AND THE ENERGY CRISIS,
Bureau of Reclamation, Washington, D.C. Div. of Water and Land.
F. E. Ellis.
Paper presented at 1st World Congress on Water Resources, Sept 24-28, 1973, Chicago, Ill: International Water Resources Association, Milwaukee, Wisconsin, 1973. 16 p, 3 fig, 4 tab, 13 ref.

Descriptors: *Thermal powerplants, *Coal mines, *Water demand, Industrial water, Water supply, *Central U.S., Great Plains.
Identifiers: Western U.S.

Development of natural resources in the Western United States is dependent upon availability of water supplies. A large potential for the industrial development of eastern Montana, northeastern Wyoming, western North Dakota, and northwestern South Dakota exists in the vast deposits of lignite and sub-bituminous coal within the Upper Missouri River basin. Interest appears to be in using this coal in a dual-energy capacity. It can be converted to electrical energy or synthetic hydrocarbons, gasoline, and natural gas substitutes. Water is necessary to meet this technological development. (Knapp-USGS)
W74-04912

PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART 2. SOUTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.
N. M. Jackson, Jr.
North Carolina Department of Natural and Economic Resources, Office of Water and Air Resources Publication, July 1973. 255 p, 4 fig, 6 ref.

Descriptors: *Water supply, *North Carolina, Water quality, Water resources, Municipal water, Water sources, Water works, Water distribution(Applied).

Information about the public water supplies in 18 counties in the southern Piedmont section of North Carolina is compiled; this information should be useful to planners and water managers concerned with water-supply availability, water-resources development, and water quality. A water-resources appraisal and a map of each county shows the general area served by public water supplies and an inventory of each public supply in the county with 500 or more customers. The appraisal includes the population served, the adjacent communities served, the number of metered customers, the source of water, estimated allowable draft, total and industrial water use, raw and finished water storage, raw and finished water-pumping capacity, future plans, a water-resources appraisal in the immediate vicinity of the supply, and the results of chemical analyses of raw and finished water. (See also W74-01040) (Knapp-USGS)
W74-04915

NORTH CAROLINA WATER PLAN-PROGRESS REPORT-CHAPTER 22, WATER BASED RECREATION.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Office of Water and Air Resources.
For primary bibliographic entry see Field 6B.
W74-04990

A SUMMARY REPORT ON THE STUDY OF LAND AND WATER RESOURCES IN NORTHEAST GREENWICH, CONNECTICUT.
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 4D.
W74-04996

THE CHALLENGE OF ENVIRONMENTAL PROTECTION AND INDUSTRIAL DEVELOPMENT,
National Water Well Association, Houston, Tec. Research Facility.
For primary bibliographic entry see Field 6G.
W74-05083

WATER RESOURCES OUTLOOK FOR THE MINNEAPOLIS-SAINT PAUL METROPOLITAN AREA, MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 4B.
W74-05172

THE YEAR 2000 -- NUCLEAR POWER AND MAN,
Division of Reactor Development and Technology (AEC), Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-05185

REGIONAL WATER AND SEWER PLAN, THE MID-MISSOURI REGION.
Preston (D. R.), Holts Summit, Mo.
For primary bibliographic entry see Field 5D.
W74-05238

AREA-WIDE WATER AND SEWERAGE SYSTEM PLAN AND CAPITAL IMPROVEMENT PROGRAM.
Harte (John G.) Associates, Inc., Atlanta, Ga.; and Harris (Frederic R.), Inc., Jacksonville, Fla.
For primary bibliographic entry see Field 5D.
W74-05242

SAGINAW COUNTY WATER AND WASTEWATER UTILITY MASTER PLAN.
Williams (Clyde E.) and Associates, Inc., South Bend, Ind.
For primary bibliographic entry see Field 5D.
W74-05243

6E. Water Law and Institutions

SYSTEMATIC DESIGN OF LEGAL REGULATIONS FOR OPTIMAL SURFACE-GROUNDWATER USAGE--PHASE 1,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-04853

REASONABLE STATE REGULATION OF THE INTERSTATE TRANSFER OF PERCOLATING WATER,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 4A.
W74-04980

DETAILED PROJECT REPORT, DYERSBURG, TENNESSEE, FINLEY STREET AREA.
Army Engineer District, Memphis, Tenn.
For primary bibliographic entry see Field 4A.
W74-04989

STATUS OF STATE COASTAL ZONE MANAGEMENT EFFORTS.
National Oceanic and Atmospheric Administration, Washington, D.C. Coastal Zone Management Task Force.
For primary bibliographic entry see Field 2L.
W74-04995

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART I: ABSTRACTS.
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 5G.
W74-05004

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART II: SUBJECT INDEX.
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 5G.
W74-05005

A TREATISE ON CENTRALIZED MANAGEMENT OF WATER RESOURCES,
University of Southern Mississippi, Hattiesburg. Dept. of Economics.
D. C. Williams, Jr., and C. P. Cartee.
In: Watersheds in Transition; Proceedings of Symposium held at Fort Collins, Colo, June 19-1972: Urbana, Illinois, American Water Resources Association Proceedings Series, No 14, p 71-1972. 1 fig, 1 tab, 5 ref. OWRR A-041-MISS (2).

Descriptors: *Water management(Applied), *Mississippi, *Planning, *State government, Federal government, *Governmental interrelations, Political aspects, Organizations, Administration.

Centralized water resource planning at the state level in Mississippi has been an evolutionary process and one that is still not complete. The process has been complicated to some degree by the number, function and organization of federal, state and local agencies involved. The results have been fragmentation, duplication and redundancy in planning, promotion, development and management of water resources. Some of the causative factors leading to this situation and their ramifications are analyzed. A suggested structure of reorganization is also provided for water resource agencies to the state as an alternative to eliminate or alleviate some of the problems. (Knapp-USG
W74-05030

COLLABORATION OF THE U.S.S.R. AND THE U.S.A. IN THE FIELD OF HYDRAULIC ENGINEERING AND LAND RECLAMATION,
Y. M. Savvin, and Y. I. Serdyuk.
Typescript 8 p, 1972. Trans. from Gidrotekhnika i Melioratsiya, No 11, 1972.

Descriptors: *Water quality control, *Water utilization, *Irrigation programs, Water resources, *Water management(Applied), Administration, *United States.
Identifiers: *USSR, Technical exchange, Joint research.

During the Moscow meeting in May, 1972 leaders of the U.S.S.R. and the U.S.A. concluded Soviet-American agreements on joint research in the protection of the environment and on collaboration in science and technology. Specific areas of cooperation include water resources management; water quality control; irrigation systems planning and operation; automation and remote sensing as applied to water management; and the utilization of computers for the projection, construction, and management of reclamation systems. An exchange program of technical delegations between the U.S.S.R. and the U.S.A. is described. (Staplin-NWWA)
W74-05076

PUBLIC CONTROL AND REGULATION,
Melbourne Univ., Parkville (Australia).
S. D. Clark.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resource', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 12 p, 7 ref.

Descriptors: *Regulation, *Management, *Legal aspects, *Water law, *Water policy, Planning, Water resources development, Legislation, *Governments, Groundwater.
Identifiers: *Licensing, Government control, Appeal boards, Protected zones.

Governmental control of groundwater is discussed, beginning with a definition of government as registrar and grantor of rights. The fiscal, social, and political factors influencing management are explored, concluding that only government can put together the necessary capital and human resources to plan, coordinate and execute major water development programs. The development of laws concerning surface water and groundwater is summarized, including factors dictating government control of these resources. An outline of modern groundwater legislation is presented, with special attention to the following: Declaration of State title, licensing of bore construction, licensing of drillers, licensing of extraction and waste disposal, declaration of protected zones, appeal boards, and survey provisions. (Campbell-NWWA)
W74-05082

AEC IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT IN ITS LICENSING AND REGULATION OF NUCLEAR FACILITIES,
Division of Radiological and Environmental Protection (AEC), Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05186

URBAN WATER RESOURCES--POLITICS OF MANAGEMENT,
Bacon and Thomas, Washington, D.C.
F. B. Francois.
Preprint No 1876, American Society of Civil Engineers, ASCE National Water Resources Engineering Meeting, Washington, D.C., January 29-February 2, 1973. 18 p.

Descriptors: *Water resources development, *Governments, *Political aspects, *Local governments, Political constraints, State governments, Federal government, Legislation, Institutions, Administration, Sanitary engineering, Water supply, Waste disposal, City planning, Regional development, History, Urbanization, Cities.

The need for water has progressed to the point where water resources management is no longer a simple issue to be determined by a select group of individuals. The needs for water have grown, and new forces have entered into the picture to formulate policies for wise use of the limited resources available. Water management in the past was left up to the individual, at first, when private wells supplied the water and privies were widespread. Later, as wells and springs became contaminated, the cities began to enter into the picture of water management. Even so, progress was slow, and sewage treatment facilities were often lacking. The superior political strength of the state governments relative to the cities resulted in some states establishing regional authorities to handle the problems. The federal Government, however, remained largely detached from the entire activity until recently. Now, federal standards are being imposed on local governments as a result of the realization that local governments needed assistance to establish adequate programs. Along with federal standards has come a new approach to the allocation of resources. Social, political, economic and other questions are being added to the scope of the planners' duties. (Poertner)
W74-05235

FLOOD PROOFING REGULATIONS FOR BUILDING CODES,
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 6F.
W74-05236

AGRICULTURAL POLLUTION CONTROL AND ENFORCEMENT IN NEW YORK STATE,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5B.
W74-05285

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION: BIG BUFFALO CREEK-LITTLE BUFFALO CREEK--CITY OF SANFORD, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-04993

FLOOD PLAIN INFORMATION; ROANOKE RIVER-CHOCOYOTTE CREEK; CITY OF ROANOKE RAPIDS AND TOWN OF WELDON, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-04994

RIVERBANKS IMPROVEMENT PROGRAM,
Broome County Planning Dept., Binghampton, N.Y.
W. McGrath.
Southern Tier East Regional Planning Board, Binghampton, New York, February 1972. 20 p, 6 fig, 18 ref.

Descriptors: *Rivers, *River basin development, *Land management, *Flood plain zoning, *New York, River regulation, Water pollution control, Comprehensive planning, Water resources development, Floodways, Flood control, Parks, Land use, Land development, Urbanization, Conservation, Recreation facilities.
Identifiers: *Broome County(New York), *Tioga County(New York), Riverbank improvement.

Guided by the initial efforts of the Broome County Planning Department, the Southern Tier East Regional Planning Board has initiated a riverbanks improvement program of preservation and recreational development for Broome and Tioga Counties. The report is a brief description of factors which have influenced the program. Included within this framework is the concept of the program at its inception, current program status, and future program goals and objectives. There are approximately 120 miles of river segments traversing the Broome-Tioga area. Segment lengths range from a seven mile portion of the Delaware River in southeastern Broome County to a sixty mile section of the Susquehanna River which passes through the heart of the most densely populated portions of western Broome and eastern Tioga. In all, five rivers, the Chenango, Delaware, Otselic, Susquehanna, and the Tioughnioga, along with their constituent brooks and creeks, form the drainage basin for the two-county region. Although construction in floodable areas along the rivers has been discouraged by planning officials and municipalities through zoning ordinances, the desired effect has not been achieved. A list is included of the principles and policies established by the Southern Tier East Regional Planning Board. These were adopted in the formation of the Riverbanks Improvement Program for the two-county region. Initial efforts toward acquisition of specific sites along the riverbanks for recreational, educational and conservation uses are mentioned. Various financing programs of federal agencies are listed as possible sources of funds for land acquisition and development of open spaces, parks and conservation projects. (Poertner)
W74-05234

FLOOD PROOFING REGULATIONS FOR BUILDING CODES,
Army Engineer District, Pittsburgh, Pa.
A. C. Lardieri.
*Floodproofing, *Building codes, *Legal aspects, Flood damage, Legislation, Design criteria, Regulations, Design standards, Flood protection, Flood plain zoning, Flood control, Floods, Flood stages, Flood plain insurance.

Few building codes require flood-proofing of new or existing structures as a condition for flood hazard area construction or occupancy. Thousands of structures in the United States are located in flood plains and many are partially or totally unprotected from the damages of flooding. Six methods of flood plain management involving non-structural alternatives are: (1) construction of flood protection works such as dams and levees, (2) flood insurance, (3) flood disaster relief, (4) flood plain regulation, (5) government purchase of flood prone land, and (6) flood-proofing. Flood-proofing is the least well known of these methods. It can be incorporated in building codes and complement other approaches to flood control. It is most useful at the fringes of flood prone areas, where the cost of flood-proofing would be minimal, encroachment on the floodway would be negligible, and the threat to life would be minimized. A reference flood level datum should be determined for equitable application of flood-proofing requirements. Regulations should allow for the use of alternative methods of achieving minimum established goals. (Poertner)
W74-05236

6G. Ecologic Impact Of Water Development

THE HUMAN ECOLOGICAL IMPACT OF STRUCTURAL FLOOD CONTROL ON THE IOWA RIVER, IOWA,
Iowa Univ., Iowa City. Inst. of Urban and Rural Research.
For primary bibliographic entry see Field 8A.
W74-04856

AESTHETICS IN ENVIRONMENTAL PLANNING.
Stanford Research Inst., Menlo Park, Calif. Operational Evaluation Dept.
Copy available from GPO Sup Doc as EP1.23:600/5-73-009, $2.05; microfiche from NTIS as PB-229 574 $1.45. Environmental Protection Agency, Socioeconomic Studies Series, Report EPA-600/5-73-009, November 1973. 187 p, 6 fig, 4 tab, 217 ref. EPA Program. Element 1HA098.

Descriptors: *Aesthetics, *Environmental effects, Quality control, Decision making, Design standards, Design criteria, *Planning, Federal agencies, Federal reservations, *Regional analysis, *City planning, Scenery, *Research priorities, Management, *Social impact, *Attitudes.

Three primary aspects of the aesthetic concept are discussed: aesthetics and the human senses, aesthetics as thinking about the arts, and aesthetics as the science of beauty. Additional factors underlying the concept of aesthetics include: nature as an underlying force; cultural, social and economic phenomena as determiners of aesthetic expression; and aesthetics of American city life. Aesthetics is also discussed in the context of the National Environmental Policy Act. The following research projects are suggested: (1) Development of criteria for evaluating methodologies designed to assess aesthetic impacts--special emphasis on objectivity, secondary impacts, and aesthetics as an interrelated aspect of all environmental elements. (2) Increased emphasis on user preference studies for understanding individual attitudes and group values about aesthetic characteristics in the environment. (3) Development of aesthetic quality indicators for different levels of concern (national, state-regional, community-local) and devise monitoring techniques. (4) Development of methods for communicating aesthetic effects of changes resulting from planned activities--simulation labs for visual and auditory impacts. (5) Development of an information system for source material on aesthetic research. (EPA)
W74-04987

MAN'S ENVIRONMENT AND THE ATLANTIC ALLIANCE,
J. R. Huntley.
NATO Information Service: Brussels, Belgium. 1972. 2nd Ed, 62 p, Illus.
Identifiers: Books, Cities, *Environment, Health, Mans, *NATO, Safety, Society, *Water pollution, *Oil spills, *Coastal pollution.

The relationship between man's environment and the Atlantic Alliance is described. The origin of the idea for considering human environmental problems and the establishment of a Committee on the Challenges of Modern Society (CCMS) are discussed. The next section, shaping the human environment, discusses some indicators of problems, why it is an international crisis, and the ecological crisis in advanced nations. The areas in which NATO is working in the environment field: oil spills, coastal water pollution, inland water pollution, the clean engine, air pollution control, the experimental safety vehicle, aspects of road safety, disaster assistance, environment and regional development, scientific knowledge and decision-making, cities, the misuse of drugs, advanced health care, advanced waste water treatment, and environmental fellowships are discussed. A section is then included explaining the reasons why NATO is involved in this undertaking, followed by an explanation of the CCMS concepts and methods. A final section discusses the future of CCMS, including present results and prospects for the future. Three appendixes contain the following information: CCMS chronology, NATO/CCMS publications, and USA/Federal Republic of Germany bilateral agreement on the experimental safety vehicle.--Copyright 1973, Biological Abstracts, Inc.
W74-05027

THE CHALLENGE OF ENVIRONMENTAL PROTECTION AND INDUSTRIAL DEVELOPMENT,
National Water Well Association, Houston, Tec. Research Facility.
M. D. Campbell, and W. A. Hunt.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resource', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 12 p.

Descriptors: Water resources development, Supply, *Water management(Applied), *Planning, *Water demand, *Water requirements, Industrial plants, Feasibility, *Management, Economics.
Identifiers: Private water supplies, Private motives, Government motives, Centralized service, Decentralized service, Contractual service, *Environmental protection.

The need for private water supplies is well established. The subsequent question of when and where private water systems are applicable is discussed. Economic and logistic feasibility are discussed, as well as public health interests, as a function of population density. The private and government motives for developmental and regulatory roles are explored, as well as the comparison between private systems and industrial requirements. Special attention is given to operation and maintenance systems, focusing on the following: implementation, centralized and decentralized service, contractual services, selection of an organizational structure, geography, politics, income level of users, education level and motivation of users, and management. (Staplin-NWWA)
W74-05083

RADIONUCLIDES IN ECOSYSTEMS, VOLUME I.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-05181

AN ECOLOGICAL APPROACH TO THE EVALUATION OF RADIOACTIVITY WITHIN THE MAN-ENVIRONMENT ECOSYSTEM,
Emory Univ., Atlanta, Ga.
For primary bibliographic entry see Field 5B.
W74-05182

POLLUTION -- YESTERDAY, TODAY, AND TOMORROW,
For primary bibliographic entry see Field 5D.
W74-05272

MEASURING IMPACTS OF WATER RESOURCE DEVELOPMENTS ON THE HUMAN ENVIRONMENT,
Battelle-Memorial Inst., Columbus, Ohio.
J. K. Baker, and J. R. Finley.
Water Resources Bulletin, Vol 10, No 1, p 10-21, February 1974. 4 fig.

Descriptors: *Water resources development, *Social impact, *Economic impact, Social values, Employment opportunities, Environment, Psychological aspects.
Identifiers: *Human environment, *Environment impact.

An approach to measuring impacts of water resource developments on the human environment is described. This evaluation system employs a two-step assessment process. The first step is an assessment of the nature and magnitude of the impacts as reflected by parameter value estimates without and with the proposed project. The second step is the determination of overall impact by aggregating the magnitudes of specific impacts in proportion to their respective relative importance, and determining the difference between the aggregated without and with scores. (Knapp-USGS)
W74-05338

TOTAL ENVIRONMENTAL QUALITY MANAGEMENT MODELS,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05398

7. RESOURCES DATA

7A. Network Design

WORTH OF DATA USED IN DIGITAL-COMPUTER MODELS OF GROUND-WATER BASINS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 4B.
W74-04975

7B. Data Acquition

DEVELOPMENT OF A METER FOR MEASUREMENT OF SEWER FLOW,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-04857

PULSED D.C. MOTOR SPEED CONTROL FOR PORTABLE INSTRUMENTATION,
California Univ., Berkeley.
W. W. Schopp, and H. C. Richardson.
Instruments and Control Systems, Vol 46, No 12, p 45, December 1973. 3 fig.

Descriptors: *Instrumentation, *Monitoring, Pollutant identification.
Identifiers: *Pulsed DC speed control, Motors, Speed control, Controllers.

Many environmental testing instruments require that air be moved at a given rate through a filter for a specific time. This filter is then removed, and the pollutants that have been collected are measured. Most of these instruments use a blower powered by a small DC motor whose speed must be adjustable in order to calibrate the instrument. Many units are designed for portable field use, operate on batteries and use a power consuming series dropping resistor to alter the speed of blower motor. An effective speed control can be implemented by generating a square wave at a constant frequency and varying the duty cycle of the square wave. Additionally, removal of the series resistor increases the motor torque at the slower speed. The design uses a 24-volt DC motor. The pulsed DC speed control is designed around an inexpensive integrated circuit (IC) timing module with a base frequency of 250 kHz. The output pulse train is fed to the base of the Darlington connected transistors. Motor requirements up to 1 A may be handled. A resistor reduces the 24-V motor supply to 12 V for use with the IC, and may be removed if a 12-V supply is available. This control may be used for DC motors with current requirements up to 400 mA. (Mortland-Battelle)
W74-04895

DEVELOPMENT AND FLIGHT TEST OF THE MULTICHANNEL OCEAN COLOR SENSOR (MOCS),
TRW Systems Group, Redondo Beach, Calif.
P. G. White, K. R. Jenkin, R. C. Ramsey, and M. Sorkin.
Available from NTIS, Springfield, Va 22151 NASA CR-2311, Printed price $4.75 domestic, $7.25 foreign; $1.45 microfiche. National Aeronautics and Space Administration Contractor Report NASA CR-2311, October 1973. 167 p, 101 fig, 14 tab, 5 ref. NASA contract NASI-10918.

Descriptors: *Remote sensing, *Spectrometers, *Oceanography, Instrumentation, Data processing, Data collections, *Chlorophyll, Pollutant identification.

Identifiers: Radiometry, *Spectroradiometers.

An imaging spectroradiometer (Multichannel Ocean Color Sensor) was designed, developed and flight tested. Computer routines were developed specifically for the program. These included routines to calibrate the data, convert units, plot spectra from specified points in the target area, apply algorithms to identify different types of matter in the water, and generate maps showing variations in the distribution of these algorithm values over the target areas. These maps can be prepared in false color, as density plots, or as contour plots. Data were obtained from both east and west coasts of the United States, the coast of Africa, the Canary Islands, the Gulf Stream, the Bahamas, and the Gulf of Mexico, as well as some freshwater lakes. Differences in chlorophyll concentrations less than 0.1 mg per cu m were readily detected and mapped from an altitude of 11,100 m. (Knapp-USGS)
W74-05026

PULSE-TEST RESPONSE OF A TWO-ZONE RESERVOIR,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 4B.
W74-05077

BOREHOLE GEOPHYSICS AS APPLIED TO GROUNDWATER,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W74-05118

A THEORY OF MICROWAVE APPARENT TEMPERATURE OVER THE OCEAN,
Kansas Univ./Center for Research, Inc., Lawrence.
For primary bibliographic entry see Field 2B.
W74-05126

ANNOTATED BIBLIOGRAPHY ON PRECIPITATION MEASUREMENT INSTRUMENTS,
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 2B.
W74-05169

RADIOLOGICAL SURVEY OF THE AREA SURROUNDING THE ELK RIVER REACTOR, ELK RIVER, MINNESOTA.
EG and G., Inc., Las Vegas, Nev. Aerial Surveillance Dept.
For primary bibliographic entry see Field 5B.
W74-05179

MINICOMPUTERS' ROLE IN MONITORING,
Digital Equipment Corp., Maynard, Mass.
For primary bibliographic entry see Field 5A.
W74-05297

POTENTIOMETER RECORDERS.
Measurements and Data, Vol 7, No 6, p 62-71, November/December 1973. 2 fig.

Descriptors: *Potentiometers, Resistivity, Specifications, Electronic equipment, Design standards.
Identifiers: *Recorders, Servomotors.

Null-balance recorders are servo-operated devices generally referred to as 'Potentiometers.' The advantages of the null-balance potentiometer are (1) high sensitivity, down to microvolt signals, and (2) independence of lead length. Nearly all process and test variables can be measured in terms of microvolt or millivolt electric signals, and often must be measured at large distance from the point of recording. The potentiometer recorder meets these needs. Further, the potentiometer can be used with minor modifications as a null-balancing bridge-input recorder, which is basically a resistance (or inductance or capacitance) measuring device. A departure from standard servo recorder design is the 'Speed Servo' with a response speed faster than potentiometer recorders which use servomotors, geartrains and cable or cord pen drive. In the 'Speed Servo' strings, pulleys, belts, gears and rotary servomotor are replaced by a servomotor whose armature operates back and forth like a shuttle. This armature features drive coil allowed to slide freely along the pole piece in a magnetic field (produced by the permanent magnet). Current in the drive c coil horizontally. Specifications (channels, FS response, comments, and prices) are given for potentiometers from 69 different suppliers. (Mortland-Battelle)
W74-05298

A SAMPLER FOR THE CHEMICAL ANALYSIS OF FRESHWATERS USING EVACUATED TUBES,
Trent Univ., Peterborough (Ontario). Dept. of Biology.
R. Jones, and C. J. S. Stuart.
Limnology and Oceanography, Vol 18, No 5, p 805-809, September 1973. 2 fig, 4 ref.

Descriptors: Freshwater, Chemical analysis, *Water sampling, Water analysis.
Identifiers: *Sampling equipment, *Water sampler.

A freshwater sampler is described having three evacuated glass tubes which fill simultaneously at the selected depth when each rubber sealing stopper is pierced by a hypodermic needle. Each tube acts as the sample collector and container. (Holoman-Battelle)
W74-05321

7C. Evaluation, Processing and Publication

THE APPLICATION OF BINARY TREE STRUCTURES TO HYDROLOGIC NETWORK SIMULATORS,
Nebraska Univ., Lincoln. Dept. of Computer Science.
For primary bibliographic entry see Field 4A.
W74-04852

COMPUTER SIMULATION OF THE HYDROLOGIC AND SALINITY FLOW SYSTEMS WITHIN THE BEAR RIVER BASIN,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5B.
W74-04860

INTERFACING A PROGRAMMABLE ELECTRONIC CALCULATOR WITH AN AUTOMATIC AMINO ACID ANALYZER,
Richard B. Russell Agricultural Research Center, Athens, Ga.
For primary bibliographic entry see Field 5A.
W74-04866

APPROXIMATING DISCRETE DISTRIBUTIONS, WITH APPLICATIONS,
California Univ., Riverside. Dept. of Statistics.
D. V. Gokhale.
Journal of the American Statistical Association, Vol 68, No 344, p 1009-1012, December 1973. 14 ref.

Descriptors: *Statistical methods, *Probability, Analog models, Algorithms.
Identifiers: *Discrimination information, Probability distribution, Contingency tables.

A generalized procedure is presented of finding the discrete distribution which minimizes, subject to a set of linear constraints on the probabilities, the 'discrimination information' with respect to a given probability distribution. A convergent iterative algorithm is modified to serve this purpose. Many applications are discussed including analyses of contingency tables and some discrete analogues of the one-sample and several-samples problem. A test for the validity of the imposed constraints is provided by a test-statistic distributed asymptotically like a chi sq
W74-04892

BAYESIAN ANALYSIS OF A BIVARIATE NORMAL DISTRIBUTION WITH INCOMPLETE OBSERVATIONS,
Temple Univ., Philadelphia, Pa. Dept. of Mathematics.
J. S. Mehta, and P. A. V. B. Swamy.
Journal of the American Statistical Association, Vol 68, No 344, p 922-927, December 1973. 1 fig, 2 tab, 11 ref.

Descriptors: *Statistical methods, Average, Distribution, Estimating, Equations, Statistical models.
Identifiers: *Bayesian analysis, *Bivariate normal population, Inferences, Data interpretation, Nuisance parameters, Incomplete observations, Difference of means.

A specific problem of making inferences about the difference of the means in a bivariate normal population is considered when the sample has some missing values corresponding to one or both variables. The purpose of the study was to evaluate the effects of extra observations from the populations of x sub 1 and x sub 2 on the overall inferences about the difference of the means. A Bayesian solution to the problem is offered. One advantage of the Bayesian approach is that the nuisance parameters can be eliminated by straightforward integration. The effects of extra observations from the populations of x sub 1 and x sub 2 on the overall inferences about the difference of the means can be evaluated by analyzing the marginal posterior distribution of the difference of the means which incorporates a proper allowance for the roles of the nuisance parameters in the model. (Mortland-Battelle)
W74-04893

MAXIMUM LIKELIHOOD ESTIMATION FOR MIXTURES OF TWO NORMAL DISTRIBUTIONS,
Colorado Univ., Denver. Medical Center.
N. P. Dick, and D. C. Bowden.
Biometrics, Vol 29, No 4, p 781-790, December 1973. 2 fig, 2 tab, 16 ref.

Descriptors: *Distribution patterns, *Probability, *Monte Carlo method, Average, Fisheries, Estimating, Size, Fish.
Identifiers: Variance, Hessian matrix, Normal distribution, Sample size, Maximum likelihood, Data interpretation, Difference of means, Mixtures.

Primary concern is focused on estimation of the parameters mu 1, rho 1 squared, mu 2, rho 2 squared, and p in the mixture of two normal distributions when independent sample information is available from one of the populations. The solution to the maximum likelihood (ML) equations was obtained using Newton's iterative method. Some interesting results for the moment estimates were obtained for the case when independent sample observations are available from one population. Extensive Monte Carlo simulation was employed to obtain the sample variances of the estimates as well as the estimated asymptotic variances. The variances of the estimates are influenced by the separation of the two means with respect to the variances, the mixture proportion (p), and, of course, the size of the sample. When the number of observations is small and the means

are not well separated, the sample variance of the estimates can be as much as three times greater than the estimated asymptotic variances. The problem motivating this research originated in fisheries where it was necessary to estimate the average lengths of the two separate plants of fish after one year, the population variances of the lengths, and the mixture proportion using the entire sample. (Mortland-Battelle)
W74-04898

THE ESTIMATION OF RELATIVE POTENCY FROM TWO PARABOLAS IN SYMMETRIC BIOASSAYS,
Edinburgh Univ. (Scotland). Dept. of Statistics.
For primary bibliographic entry see Field 5A.
W74-04899

IDENTIFICATION OF BACTERIA BY COMPUTER: GENERAL ASPECTS AND PERSPECTIVES,
Central Public Health Lab., London (England). National Collection of Type Cultures.
For primary bibliographic entry see Field 5A.
W74-04909

IDENTIFICATION OF BACTERIA BY COMPUTER: IDENTIFICATION OF REFERENCE STRAINS,
Central Public Health Lab., London (England). National Collection of Type Cultures.
For primary bibliographic entry see Field 5A.
W74-04910

BOMEX RAINY DAY ANALYSIS,
National Oceanic and Atmospheric Administration, Washington, D.C. Center for Experiment Design and Data Analysis.
For primary bibliographic entry see Field 2B.
W74-04921

ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE--SUMMARY OF EIGHTH MEETING, JUNE 5-7, 1973, PORTLAND OREGON.
Geological Survey, Washington, D.C. Office of Water Data Coordination.
1973. 45 p, 2 fig.

Descriptors: *Hydrologic data, *Data collections, Planning, Data processing, *Data storage and retrieval, Federal government, Water resources development, *Water quality standards, Baseline studies.
Identifiers: *Willamette River.

Members of the Advisory Committee were in general agreement that the Office of Water Data Coordination had done a good job during the past year of keeping them informed of developments in the resources and environmental information fields. Suggestions made during the general discussion which followed included: that the Geological Survey give serious consideration to establishing a closer working relationship between Federal water-data-collection agencies and those of the States; that consideration be given to holding joint meetings of the Federal Advisory Committee on Water Data and the Advisory Committee on Water Data for Public Use; and that State water-data programs be strengthened, and Federal and State efforts in the area of water-data collection and dissemination be blended into a single national effort. During the discussion the increasing need for environmental baseline data was stressed. A session was devoted entirely to a presentation and discussion of the pilot study, Intensive River-Quality Assessment of the Willamette River. (Knapp-USGS)
W74-04924

A STUDY OF THE RELIABILITY OF CONTINUOUS WATER QUALITY MONITORING,
Tennessee Univ., Knoxville. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W74-04982

THE DEVELOPMENT AND FIELD TESTING OF A BASIN HYDROLOGY SIMULATOR,
Kansas Univ., Lawrence. Dept. of Chemical and Petroleum Engineering.
For primary bibliographic entry see Field 2A.
W74-04984

DEVELOPMENT AND FLIGHT TEST OF THE MULTICHANNEL OCEAN COLOR SENSOR (MOCS),
TRW Systems Group, Redondo Beach, Calif.
For primary bibliographic entry see Field 7B.
W74-05026

FLOOD STAGES AND DISCHARGES FOR SMALL STREAMS IN TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-05107

EVALUATION OF GROUND-WATER DATA,
Geological Survey, Atlanta, Ga.
For primary bibliographic entry see Field 4B.
W74-05119

COLLECTION OF GROUNDWATER DATA,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 4B.
W74-05120

REGRESSION TECHNIQUES FOR ESTIMATION OF SULFATE IN STREAMS DRAINING AN AREA AFFECTED BY COAL MINING,
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 5B.
W74-05125

ON THE AUTOMATIC COMPUTATION OF GEOELECTRIC SOUNDING CURVES,
Indian Inst. of Tech., Kharagpur.
R. K. Sarkar, and H. P. Patra.
Indian Hydrology, Vol 9, No 1, p 38-45, June 1973. 4 fig, 6 ref.

Descriptors: *Data processing, *Geophysics, *Electrical studies, Simulation analysis, Resistivity, Conductivity.

An algorithm is given for the construction of synthetic geoelectric sounding curves. The method presented is simple and fast, and can be operated with slower computers. Given the preliminary results of interpretation of resistivity sounding field data, the synthetic curves may be generated with the help of a digital computer with a prescribed accuracy limit. This serves as a check on the results of preliminary interpretation, and thus forms an integral part of geoelectric data interpretation. (Knapp-USGS)
W74-05129

LARGE RIVERS OF THE UNITED STATES.,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2E.
W74-05138

FOCAL ON THE PDP-9 COMPUTER,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
S. H. Whitlow.
Report Series No 24, 1973. 16 p, 11 ref, append.

Descriptors: *Digital computers, *Computer programs, *Programming languages, *Data processing, Hydrologic data, Canada.

In the Water Science Subdivision of the Canadian Inland Waters Directorate, the PDP-9 computer is used for a variety of scientific calculations. These include analysis of X-ray diffraction, viscosity, density, conductivity, and chromatographic experiments. Often results are needed quickly for calibration purposes or as parameters in subsequent experiments; alternately, mathematical analysis may be used to derive final results and to establish statistical criteria. Much of the data processing is done by means of programs written within the Subdivision and it is anticipated that some of these computer programs of general interest will be described in a future report. This report is designed to be an operating guide for running user programs on the Water Science Subdivision PDP-9 digital computer. It is to permit users with little or no computer background to run simple programs using the FOCAL (FOrmula CALculator or Formulating On-line Calculations in Algebraic Language) conversational language. Operating procedures have been gathered from various sources and are combined with techniques developed through usage to provide step-by-step direction. A new external function, FDRA, is described which adds a straight line display capability to FOCAL. Directions are given to utilize this feature in user programs and an example, 'Least-squares fit with scope display', is provided. (Knapp-USGS)
W74-05151

MIXTURE, A COMPUTER PROGRAM FOR THE CALCULATION OF HOT WATER TEMPERATURE AND MIXING FRACTIONS OF LARGE VOLUME WARM SPRINGS OF MIXED WATER ORIGIN,
Geological Survey, Menlo Park, Calif.
A. H. Truesdell, R. O. Fournier, and J. M. Thompson.
Available from NTIS, Springfield, Va 22151 PB-220 732; Price $3.00 printed copy; $1.45 microfiche. Computer Contribution USGS-GD-73-014, 1973. 9 p.

Descriptors: *Hot springs, *Mixing, *Water temperature, Geochemistry, Hydrogeology, Water chemistry, Silica.
Identifiers: Hydrogeochemistry.

Some warm (<80 dec C) springs originate from the subsurface mixture of hot and cold water. This computer program calculates the fraction and temperature of the hot water component from the temperature and silica contents of the warm spring and of normal cold springs of the area. (Knapp-USGS)
W74-05156

STORM OF MAY 5-6, 1973, IN THE DENVER METRO AREA: FREQUENCY AND EFFECT,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2E.
W74-05171

THE YEAR 2000 -- NUCLEAR POWER AND MAN,
Division of Reactor Development and Technology (AEC), Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-05185

COTTON: A COMPUTER SIMULATION OF COTTON GROWTH,
Agricultural Research Service, Tucson, Ariz. Cotton Production Research Unit.
For primary bibliographic entry see Field 3F.
W74-05213

REGIONAL ENVIRONMENTAL POLLUTION STUDY: INVENTORY AND ANALYSIS.
Tulsa City-County Health Dept., Okla.
For primary bibliographic entry see Field 5B.
W74-05239

MODELS FOR ENVIRONMENTAL POLLUTION CONTROL.
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5B.
W74-05386

MODELING OF WASTEWATER DISPOSAL SYSTEMS,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5D.
W74-05388

8. ENGINEERING WORKS

8A. Structures

THE HUMAN ECOLOGICAL IMPACT OF STRUCTURAL FLOOD CONTROL ON THE IOWA RIVER, IOWA,
Iowa Univ., Iowa City. Inst. of Urban and Rural Research.
J. S. Gardner, and N. B. Hultquist.
Available from National Technical Information Service as PB-228 644 $16.50 in paper copy, $1.45 in microfiche. Iowa State Water Resources Research Institute, Iowa State University, Ames, Iowa. Report ISWRRI-58, December 1973. 258 p, 17 fig, 32 tab, 140 ref, append.

Descriptors: Dams, Environment, Floods, *Flood control, Land use, Reservoirs, Iowa, *Social impact, Ecology, *Social change, Recreation, Attitudes, *Environmental effects, *Post-impoundment.
Identifiers: Coralville reservoir(Iowa), *Iowa River(Iowa).

Human ecological impacts of the Coralville Dam and Reservoir, a flood control structure on the Iowa River, Iowa are described. Impacts include agricultural and urban land use changes, recreation participation growth, changes in stream hydrology, erosion, debris and problems associated with prolonged, controlled outflows from the dam and high water levels in the reservoir, and a number of indirect effects of these changes. Development of the project and the changing nature of concerns, conflicts and impacts over time are reviewed. Perceptions of floods and flood control are examined in a sample population along the Iowa River and the results compared with those on the Cedar River, an uncontrolled stream and the Des Moines, a recently controlled stream. Particular attention is directed to the flood of 1973. Prolonged and high outflows from the dam have produced downstream flooding on agricultural land. Resulting conflicts between farmers and the Corps of Engineers over the flood control structure and its operation have lessened its beneficial image at the local level. The research indicates careful attention should be directed to scale of impact, dynamics of impact, zone or location of impact, socio-economic distribution of impact and components of impact, in environmental and human ecological analyses.
W74-04856

PROCEEDINGS OF FOURTH SANITARY ENGINEERING CONFERENCE ON WATER DISTRIBUTION SYSTEMS.
For primary bibliographic entry see Field 5F.
W74-05006

HYDRAULICS OF WATER DISTRIBUTION SYSTEMS,
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 5F.
W74-05007

APPLICATIONS OF SYSTEM ANALYZERS: A SUMMARY,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W74-05008

PIPE MATERIALS, COATINGS, AND JOINTS FOR WATER DISTRIBUTION SYSTEMS,
Black and Veatch, Kansas City, Mo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W74-05009

WATER MAIN LAYING,
Kuch and Watson, Inc., Lake Bluff, Ill.
For primary bibliographic entry see Field 5F.
W74-05010

TAPPING, DISINFECTION, AND INSPECTION OF WATER MAINS,
Cedar Rapids Water Works, Iowa.
For primary bibliographic entry see Field 5F.
W74-05011

OBSERVING FIRE PROTECTION REQUIREMENTS IN FUTURE WATER SYSTEM DESIGN,
Illinois Inspection Bureau, Chicago.
For primary bibliographic entry see Field 5F.
W74-05012

MAINTENANCE OF WATER DISTRIBUTION SYSTEMS,
Jackson Water Dept., Mich.
For primary bibliographic entry see Field 5F.
W74-05013

VALVES, HYDRANTS, AND MAIN LINE METERS,
Racine Water Dept., Wis.
For primary bibliographic entry see Field 5F.
W74-05014

DOMESTIC SERVICE METERS,
Hersey-Sparling Meter Co., Dedham, Mass.
For primary bibliographic entry see Field 5F.
W74-05015

FLOOD PROOFING REGULATIONS FOR BUILDING CODES,
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 6F.
W74-05236

EQUIVALENT PIPE METHODS FOR OPTIMIZING WATER NETWORKS--FACTS AND FALLACIES,
Roorkee Univ. (India).
P. K. Swamee, and P. Khanna.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 100, No EEI, Proceedings paper No 10375, p 93-99, February 1974. 1 fig, 21 equ, 6 ref.

Descriptors: *Economics, *Environmental engineering, *Water distribution(Applied), *Water supply, *Networks, Optimization, *Pipes, Mathematical models, Systems analysis,
Identifiers: Equivalent length approach, Equivalent diameter approach.

A simple water supply loop has been optimized by lag-range-multiplier method. The equivalent length and equivalent diameter approaches for optimizing the same loop, and for water distribution network optimization in general, are critically examined, and the inherent fallacies are considered. The problem of minimizing water network cost reduces essentially to the optimization of a nonlinear objective function subject to nonlinear constraints involving nonanalytical functions. The problem in its original form is unsolvable by known mathematical techniques. Attempts to obtain optimal solution have been either through simplification of the physical problem via certain assumptions, or through the use of objective functions based on equivalent pipe concepts. This paper examines the latter approach to optimization of pipe networks. This approach towards optimization of water networks is based upon knowledge of the pressure surfaces a priori. (Bell-Cornell)
W74-05383

8B. Hydraulics

DEVELOPMENT OF A METER FOR MEASUREMENT OF SEWER FLOW,
Illinois Univ., Urbana. Dept. of Civil Engineering.
H. G. Wenzel, Jr.
Available from National Technical Information Service as PB-228 661 $7.00 in paper copy, $1.45 in microfiche. University of Illinois Water Resources Center Research Report No 74, 1973, 65 p, 25 fig, 4 tab, 20 ref, 2 append. OWRR B-063-ILL(2). 14-31-0001-3581.

Descriptors: *Pipe flow, Instrumentation, *Venturi meters, *Flow measurement, Discharge measurement, Urban drainage, Open channel flow, Design criteria, Performance, Optimization.
Identifiers: *Sewer flow, *Flow meter.

An experimental and analytical study was performed to develop the geometry for a Venturi type flow meter for use in sewer flow measurement. The meter consists of a constriction in the pipe which produces critical flow under open channel flow conditions and acts as a conventional Venturi meter under full flow conditions. The constriction is constructed using cylindrical segments whose diameters are larger than that of the pipe and which are attached to the sides of the pipe, leaving the invert and crown clear. Head loss characteristics and experimental rating curves for both open channel and full flow conditions are described. A procedure is presented, based on experimental data, to theoretically construct a rating curve if experimental calibration is impractical. Information is also presented to permit the selection of geometrical parameters for optimum performance for a specific installation.
W74-04857

EXPERIMENTAL DETERMINATION OF RUN-UP OF UNDULAR AND FULLY DEVELOPED BORES AND AN EXAMINATION OF TRANSITION MODES AND INTERNAL STRUCTURE,
Chicago Univ., Ill. Fluid Dynamics and Sediment Transport Lab.
R. L. Miller.
Available from NTIS as AD-676 312 for $6.00 paper copy, $1.45 microfiche. Technical Report No. 8, prepared for the Office of Naval Research, June 1968. 47 p, 12 fig, 25 ref. Nonr-2121(26).

Descriptors: *Bores, *Waves(Water), *Shallow water, Slopes, Beaches, Aeration.
Identifiers: Long wave theory, Progressive waves, Breaking waves, *Run-up, *Wave run-up.

The run-up of undular surge and bore is determined experimentally, for four slopes each with 3 different bottom roughnesses. The run-up is strongly affected by both slope and bottom roughness. Experimental data on run-up, and changes in structure and celerity of the wave front during progression up slope, disagree in several fundamental aspects with presently published rele-

vant theory based on the non-linear long wave equations. Photographic evidence is presented of two related phenomena in the higher Froude number ranges of the fully developed bore. These are (a) the generation of large eddies which appear to form at the bore face and progress with decreasing diameter toward the rear of the bore, and (b) the associated inclusion of air into the internal portion of the bore (aeration). (Sinha-OEIS)
W74-04936

SELECTION AND DESIGN OF A BORE GENERATOR FOR THE HILO HARBOR TSUNAMI MODEL. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. C. Shen.
Available from NTIS as AD-646 509 for $6.00 paper copy, $1.45 microfiche. Research Report No. 2-5, June 1965. 123 p, 49 fig, 1 tab, 33 ref, 2 append.

Descriptors: *Harbors, Model studies, *Tsunamis, *Bores, *Shallow water, Bays, Coasts, *Hawaii, *Hydraulic models.
Identifiers: Hilo Harbor(Hawaii), Bore generator.

Theoretical and experimental investigations were made of the generation of a bore by the three following types of bore generator: (a) piston type, (b) gate type, and (c) pneumatic type. The analyses were based on nonlinear shallow-water theory incorporated with bore conditions. The experiments were conducted in a test flume 1 ft wide and 40 ft long. Explicit solutions were obtained for the height, duration, and length of bores generated by each type of generator. The bore heights found experimentally agreed very well with the theoretical predictions. A numerical computation of the pneumatic chamber theory was also performed and showed remarkable agreement with test results of the pneumatic-type bore generator. A uniform slope of 3 percent was installed in the test flume to investigate the bore motion over a uniform slope. The bore transformation was found to agree with Whitham's approximate solution. The bore runup reached a height above still-water level 2.6 to 3.0 times greater than the initial height of the bore on the flat bottom. The breaking of the bore during its transformation was also studied. Due to its inexpensiveness and versatility, a pneumatic-type bore generator was recommended for use in the model of Hilo harbor, Hawaii for investigation of tsunami-wave attack at Hilo. (Sinha-OEIS)
W74-04946

EDGE BORES,
Tetra Tech, Inc., Pasadena, Calif.
D. Divoky, and J. Lane.
Final Report No. TT-P-282-73-1, prepared for Office of Naval Research, April 1973. 53 p, 30 fig, 1 tab, 7 ref. N00014-72-C-0366.

Descriptors: *Bays, *Bores, *Harbors, *Beaches, Landslides, *Coastal structures, *Waves(Water), Explosions, *Shore protection.
Identifiers: *Edge bores, Edge waves.

In an experimental test program, the wave height variation along a crest, from deepwater to shore, received primary attention. It was found that under certain conditions the wave height near shore could be as much as five times the offshore height. Such wave amplification is possible at the beach even in the case of zero angle of incidence. Empirical prediction rules were derived. In an edge bore the onshore segment travels at the offshore speed; large lateral flow continually replenishes losses in the edge bore breaking region; the crest is not refracted over the abrupt depth changes. While the offshore segment is limited in height by the offshore depth, the nearshore segment may in fact be of even greater height depending upon beach slope and angle of incidence. The practical importance of the edge bore phenomenon is that shoreline installations can be subjected to waves of very great height when the usual expectation might be only small waves. (Sinha-OEIS)
W74-04948

ESTUARY AND COASTLINE HYDRODYNAMICS.
For primary bibliographic entry see Field 2L.
W74-04950

HURRICANE STUDIES FOR NARRAGANSETT BAY,
Corps of Engineers, Waltham, Mass. New England Div.
J. B. McAleer.
In: Proceedings of Ninth Conference on Coastal Engineering, Lisbon, Portugal, June 1964, American Society of Civil Engineers, Chap 42, p 660-685, 1964. 12 fig, 16 ref.

Descriptors: *Hurricanes, *Shore protection, *Rhode Island, *Coastal engineering, *Surges, Flooding, Coasts, Mathematical models, *Bays, Hydraulic models.
Identifiers: Narragansett Bay(RI).

Hurricane flooding has emerged as one of the major coastal engineering problems of the Atlantic and Gulf Coast areas of the United States. Engineering and scientific investigations have been made to determine the fundamental mechanics of the hurricane surges that cause inundation of coastal areas and to develop practical and economical protection. Mathematical models and large hydraulic models were used for the Narragansett Bay studies of two major projects. The discussions presented are limited to the hydraulic studies of barriers at the mouth of the bay, known as the Lower Bay Barrier Plan, and the Fox Point Hurricane Barrier which is now under construction. (Sinha - OEIS)
W74-04970

NUMERICAL PREDICTION ON TYPHOON TIDE IN TOKYO BAY,
Central Research Inst. of Electric Power Industry, Tokyo (Japan).
For primary bibliographic entry see Field 2L.
W74-04971

HYDRAULICS OF WATER DISTRIBUTION SYSTEMS,
Greeley and Hansen, Chicago, Ill.
For primary bibliographic entry see Field 5F.
W74-05007

APPLICATIONS OF SYSTEM ANALYZERS: A SUMMARY,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W74-05008

ENLARGEMENT OF THE CHESAPEAKE AND DELAWARE CANAL, HYDRAULIC AND MATHEMATICAL MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
M. B. Boyd, W. H. Bobb, C. J. Huval, and T. C. Hill.
Available from NTIS as AD-768 779, $6.25 in paper copy. Technical Report H-73-16, October 1973. 436 p, 18 fig, 4 tab, 22 ref, 243 plates.

Descriptors: *Hydraulic models, *Mathematical models, Delaware River, Chesapeake Bay, *Canals, *Canal construction, Tidal effects, Density currents, Salinity, *Coastal engineering.

Enlargement of the sea-level C and D Canal connecting Chesapeake Bay and Delaware River from 27 by 250 ft to 35 by 450 ft, undertaken in 1954, was essentially complete by 1970 except for about a 2-mile reach at the Delaware River end. Concern about effects of the enlargement on the environmental and biological systems led to the decision to leave the unimproved reach intact, pending completion of extensive environmental studies. This report is concerned with the model studies. The existing Delaware River model was extended to include the 27- by 250-ft C and D Canal and Elk River and the propagation of tides and currents in the addition was verified. Tides, currents, salinities, and discharges were then measured for various head differentials across the canal. The canal was first enlarged to existing conditions (35 by 450 ft, except for the unimproved reach at the Delaware end) and subsequently to project conditions and comparative measurements were made. The critical phenomena affecting flow in the canal is head differential across the canal produced by Chesapeake Bay tides at the western end and Delaware River tides at the eastern end. The canal is a very dynamic system and can experience large differential changes daily. Net flow is toward the lower tide level and enlargement from 27 by 250 ft to August 1972 conditions caused net flow to be increased by a factor of about 4.8 and completion of enlargement will cause additional increases. Dye dispersion tests were made for 27 by 250 ft and completed canal conditions and a mean differential. An existing numerical model based on the one-dimensional unsteady flow equations was used for initial studies concerning net flow changes due on the enlargement. (Sinha - OEIS)
W74-05036

STUDY OF BEACH WIDENING BY THE PERCHED BEACH CONCEPT SANTA MONICA BAY, CALIFORNIA. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
C. E. Chatham, Jr., D. D. Davidson, and R. W. Whalin.
Available from NTIS as AD-765 433, $4.50 in paper copy. Technical Report H-73-8, June 1973. 131 p, 18 tab, 20 ref, 1 append, 24 photos, 14 plates.

Descriptors: California, *Hydraulic models, *Coastal engineering, Beaches, Rip currents, Sediment transport.
Identifiers: Perched beaches, Freeway locations, Rubble mound structures.

Hydraulic models were studied in determining the technical feasibility and optimum design factors of the perched beach concept for widening the existing beach to provide right-of-way for a freeway along a portion of the Santa Monica Bay coastline. The following parts of the study were completed: (a) An undistorted, three-dimensional, fixed-bed model (scale 1:100) was used to determine the effect of the perched beach on rip currents. If adverse interactions were found to be present, the model was to be used to determine means of minimizing them. (b) A distorted-scale (1:100 horizontal, 1:50 vertical), two-dimensional, movable-bed model was used to estimate the amount of sand which might be lost seaward over the toe structure due to normal and storm wave actions and to determine the optimum crown elevation of the submerged structure and the length of stone riprap apron required to reduce the seaward migration of sand to a minimum. (c) An undistorted, two-dimensional model (scale 1:30) was used to determine the structural design of the proposed rubble-mound toe structure for various depths. (Sinha - OEIS)
W74-05039

BOREHOLE SAMPLING OF SATUARATED UNCEMENTED SANDS AND GRAVELS,
Commonwealth Scientific Industrial Research Organization, Syndal (Australia). Div. of Applied Geomechanics.
For primary bibliographic entry see Field 8G.
W74-05081

THE INTERPRETATION OF INTERFERENCE TESTS IN NATURALLY FRACTURED RESERVOIRS WITH UNIFORM FRACTURE DISTRIBUTION,
Atlantic Richfield Co., Dallas, Tex.
For primary bibliographic entry see Field 8G.
W74-05086

PRESSURE INTERFERENCE EFFECTS WITHIN RESERVOIRS AND AQUIFERS,
Standard Oil Co. of California, San Francisco.
For primary bibliographic entry see Field 4B.
W74-05087

THE SKIN EFFECT IN PRODUCING WELLS,
W. Hurst, J. D. Clark, and E. B. Braver.
Journal of Petroleum Technology, Vol 21, No 11, p 1483-1489, November, 1969. 7 fig, 2 tab, 7 ref.

Descriptors: *Flow rates, *Inflow, *Permeability, *Wells, Boreholes, Fluid flow, Laplaces equation, Oil reservoirs, Pressure, Mathematical model.
Identifiers: *Skin effect, Positive skin, Negative skin, Pressure drop, Cumulative production.

The change in permeability in the zone around the wellbore is called the skin effect. If the permeability in the skin zone is less than that of the formation the skin is positive; if greater, the skin is negative. If the two permeabilities are equal, there is no skin. Van Everdingen and Hurst have given mathematical solutions to the case of a zone of reduced permeability around the wellbore by treating the positive skin as a zone of reduced permeability of infinitesimal thickness. In calculating negative skin by this approach mathematical difficulties arise. These can be overcome by assuming an enlarged wellbore radius and using the same equations that apply for positive skin. The cumulative fluid influx into a well was calculated for positive and negative skin values of 0, 2.5, 5, 10, 15, 25, and 50, and for dimensionless time ranging from 100 to 10,000,000. With increase in positive skin the fluid influx is decreased. The larger the absolute value of a negative skin, the greater the apparent wellbore radius and the cumulative fluid influx into the well at any given time. (Gray-NWWA)
W74-05088

INTERPRETATION OF BOUNDARY EFFECTS FROM PUMPING TEST DATA,
Geological Survey, Trenton, N.J. Groundwater Branch.
S. M. Lang.
Journal American Water Works Association, Vol 52, No 3, p 356-364, March, 1960. 6 fig, 2 tab, 6 ref.

Descriptors: *Groundwater, *Wells, *Boundary processes, *Pumping test, Hydraulics, *Hydraulic models, 8theis equation.
Identifiers: Theis nonequilibrium formula, Image well model, Inverted image well model.

The hydraulic characteristics of an aquifer of infinite areal extent and of uniform permeability that define its abilities to store and transmit water are generally determined from the analysis of pumping test data by means of various formulas. The nonequilibrium formula developed by Theis is reviewed. A modification is presented of the Theis formula to extend its application to situations in which the pumped formation is adjacent to another formation of a vastly different transmissibility and the boundary between the formations approximates a straight line. Image and inverted image well models are discussed. (Campbell-NWWA)
W74-05089

CORROSION CONTROL SPEEDS UP,
Clark, Dietz and Associates, Urbana, Ill. Environmental Engineering Section.
For primary bibliographic entry see Field 8G.
W74-05090

WELL COST ANALYSIS,
National Water Well Association, Houston, Tex. Research Facility.
M. D. Campbell.
Water Well Journal, Vol 27, No 6, p 41-44, June 1973.

Descriptors: Wells, *Water wells, Economics, *Cost analysis, Bids, Appraisals, *Construction costs.
Identifiers: *Well cost analysis, Guarantees.

Obtaining a safe and sanitary water supply of adequate quantity to satisfy the owner demands proper well cost analysis. A determination of water needs is a first step, followed by selecting a proper design to assure a sanitary supply. Factors to keep in mind when selecting a contractor are reviewed: reputation of contractor with previous customers, condition and type of equipment he uses, and contractors' design suggestions and guarantees offered. Comparing costs can be more effective by giving attention to the following questions: What capacity is desired; what well-life is desired; what well system efficiency is desired; what quality of well construction and completion will the customer accept. (Staplin-NWWA)
W74-05091

HOW AREAL HETEROGENEITIES AFFECT PULSE-TEST RESULTS,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W74-05092

LEAK DETECTION,
Compagnie Intercommunale Bruxelloise des Eaux (Belgium).
For primary bibliographic entry see Field 8G.
W74-05095

CHART TELLS ANNULAR CIRCULATION PRESSURES,
Continental Oil Co., Houston, Tex.
R. Goldsmith.
The Oil and Gas Journal, Vol 70, No 45, p 66-70, November 6, 1972. 5 fig, 1 tab, 6 ref.

Descriptors: *Laminar flow, *Flow resistance, Hydraulics, *Pressure, *Pumping, Viscous flow, Viscometers, Rheology, Muds, Drilling fluids, Gels.
Identifiers: *Annular circulative pressure, Plastic, Viscosity, Yield point, Initial gel strength, Rheometer.

A graphical method is a convenient means for the calculation of laminar pressure losses of time-independent non-Newtonian fluids in pipes and annuli. This procedure does not require an arbitrary model relating shear stress and shear rate. Measurements commonly made in the field are used. A smooth curve is drawn through the viscometer dial readings at 600 rpm, 300 rpm and the initial gel strength. The circulating pressure at various pumping rates can be read from the graph by referring to the applicable borehole-drill pipe combination. The effective increase in mud weight corresponding to the annular circulating pressure can be read from the chart. Examples are given of the use of the chart. (Gray-NWWA)
W74-05096

DESIGN AND USE OF RADIAL COLLECTOR WELLS,
California State Dept. of Public Health, Santa Rosa. Bureau of Sanitary Engineering.
S. V. Spiridonoff.
Journal American Water Works Association, Vol 56, No 6, p 689-698, June 1964. 4 fig, 1 tab, 13 ref.

Descriptors: *Groundwater, *Wells, *Design, Construction materials, Yield, Caissons.
Identifiers: *Radial collector wells.

Radial collector wells are horizontal perforated conduits that intercept and collect ground water derived principally from surface water infiltration. Such supplies are usually found in the sand and gravel deposits underlying and hydraulically connected with surface sources, such as rivers, lakes, or oceans. Discussed are design details, construction methods, expected yield, limitations, and typical installations of radial collector wells. This type of well enables a large area of an aquifer to be exploited, and the unrestricted access and independent control of each collector pipe permits easy regulation of flow into a caisson and inspection and backwash of the collector pipe. (Staplin-NWWA)
W74-05098

ACQUISITION AND ANALYSIS OF DATA FOR OPTIMIZED DRILLING,
Amoco Production Co., Tulsa, Okla.
J. L. Lummus.
Journal of Petroleum Technology, Vol 23, No 11, p 1285-1293, November 1971. 8 fig, 5 tab, 4 ref.

Descriptors: *Optimization, *Computer programs, *Drilling, *Drill monitors, *Well data, Data processing, Drilling equipment, Drilling fluids, Rotary drilling, Mud, Hydraulics, Cost analysis, Well casings, Blowouts.
Identifiers: 'Op Drilling' program, Drilling variables, Drill bits, Drilling rate.

The first step in preparing an optimized drilling program is to organize the data needed for computer input to calculate optimum values for the controllable drilling factors. The mud program is begun with the selection of the type of drilling fluid as determined by local conditions and experience in the area. The drilling equipment is analyzed to determine if additional mud-handling facilities are needed to maintain a low-solids mud. The hydraulics program is then generated, taking into account the mud, hole size and casing program, drill string and bottomhole assembly, limits of rig horsepower, pump pressure and capacity, and drillability of formations to be penetrated. Selection of the type of bit, rpm and weight on bit may be based on bit records and logs but will be modified as indicated by 'drill off' tests. Blowout control assistance consists of examples for instruction, well control tables and, by telephone, a well-kick model on a time-sharing computer system. As drilling progresses, the program is revised as required by analysis of daily performance and unexpected problems. The most effective method is to have a monitoring unit and computer at the rig. Lacking the computer at the drill site, the summarized information can be transmitted to a central location for analysis by specialists in drilling engineering. Computer-drawn plots permit examination of 23 variables. Usually, however, only six important variables are reviewed in a detailed analysis of the optimized program. (Gray-NWWA)
W74-05099

WELLBORE TRANSMISSIBILITY FROM AFTERFLOW-DOMINATED PRESSURE BUILDUP DATA,
Esso Production Research Co., Houston, Tex.
For primary bibliographic entry see Field 8G.
W74-05101

CONTROLLED SOLUTION MINING IN MASSIVE SALT,
Texas Univ., Austin.
G. F. Sears, and F. W. Jessen.
Society of Petroleum Engineers Journal, Vol 6, No 2, p 115-125, June 1966. 11 fig, 2 tab, 8 ref.

Descriptors: *Storage capacity, *Leaching, *Underground storage, *Mining, Sodium chloride, *Computer programs, *Salts, Storage, Aqueous solutions, Solvent extraction, Pumping.

Identifiers: Massive salt, Salt domes, Solution-control blanket, Storage cavity, Fortran, Dissolution process.

The creation of underground storage cavities for natural gas and liquified gases by dissolving salt involves consideration of the shape of the cavity, the volume of the controlling blanket (oil, gas or air), the rate at which the salt is being removed, the area in the cavity undergoing solution, and the total time required at any point in the development of the planned configuration. The vertical height of the blanket/water interface can be detected by electrical or optical means. The other variables can be related to this independent variable. Equations are given to allow calculation of the total mass removed, the quantity of blanket material necessary to achieve the desired shape, and a computer program is proposed. Results are given for three cavity shapes, showing graphically the total volume removed and the rate of removal of salt as a function of time. A controlled solution mining program for a 100-ft vertical diameter solid conic in massive salt is shown in tabular form. (Gray-NWWA)
W74-05103

NUMERICAL MARCHING TECHNIQUES FOR FLUID FLOWS WITH HEAT TRANSFER,
Carnegie-Mellon Univ., Pittsburgh, Pa.
R. W. Hornbeck.
Available from GPO, Washington, D.C. 20402, Price $3.60, Stock No. 3300-0430. National Aeronautics and Space Administration Report SP-297, 1973. 339 p.

Descriptors: *Heat transfer, *Mixing, *Numerical analysis, *Flow, Open channel flow, Jets, Boundary layers, Convection, Pipe flow, Laminar flow, Equations, Mathematical studies, Mathematical models.
Identifiers: *Marching procedures(Mathematical).

Finite difference formulations and methods of solution are given for a wide variety of fluid flow problems with associated heat transfer. The use of the term marching technique applies to any numerical method of solving an initial value problem. The term is thus applied equally to implicit and explicit techniques for the solution of parabolic and hyperbolic differential equations. Typical problems of this type are those which include any arbitrary distribution of suction or injection at a body surface, body forces such as MHD or EHD forces, any class of variable properties including those in which tabulated property variations must be used, and any type of velocity or temperature boundary condition including convection, jets, variable boundaries, and open channel flow. In the appendixes a number of topics are discussed which are of interest with respect to finite difference equations. These include a very rapid method for solving certain sets of linear algebraic equations, numerical stability, the inherent error in flow rate for confined flow problems, and a method for obtaining high accuracy with a relatively small number of mesh points. (Knapp-USGS)
W74-05128

EXPERIMENTAL STUDY OF RIVER INCISION,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
For primary bibliographic entry see Field 2J.
W74-05134

AN INVESTIGATION OF CORE DRILLING IN PERENNIALLY FROZEN GRAVELS AND ROCK,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-05170

8C. Hydraulic Machinery

SELECTION AND DESIGN OF A BORE GENERATOR FOR THE HILO HARBOR TSUNAMI MODEL. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W74-04946

MAINTENANCE OF WATER DISTRIBUTION SYSTEMS,
Jackson Water Dept., Mich.
For primary bibliographic entry see Field 5F.
W74-05013

VALVES, HYDRANTS, AND MAIN LINE METERS,
Racine Water Dept., Wis.
For primary bibliographic entry see Field 5F.
W74-05014

DOMESTIC SERVICE METERS,
Hersey-Sparling Meter Co., Dedham, Mass.
For primary bibliographic entry see Field 5F.
W74-05015

METHODS OF REDUCING POWER CONSUMPTION IN PUMPING WATER IN WATER SUPPLY SYSTEMS, INCLUDING THE USE OF BOOSTER STATIONS,
Moskovskii Inzhenerno-Stroitelnyi Institut (USSR).
N. Abramov.
In: Eighth Congress of the International Water Supply Association, September 1-5, 1969, Vienna, Austria, p M3-M20 (1969). 7 fig.

Descriptors: *Water supply, *Pumping, *Pumped storage, *Distribution systems, *Automation, *Electric power, Optimization, Water utilization, Economics, Zoning.
Identifiers: Booster stations, Computer control, Telesignalling, *Moscow water supply system.

It is of great economic importance to find ways of reducing the power consumed in pumping water in urban water mains. There are various ways in which this reduction can be achieved, and they may also contribute significantly to reducing water pumping costs. They include the following: rational selection of number, capacity and location of pumping stations; rational selection of capacity and location of pressure regulating (storage) reservoirs; rational zoning of water supply systems, i.e. subdivision into zones for individual groups of consumers, depending on the geographical relief of the locality and the pressure heads required; control of the operation of individual pumping sets and of pumping stations as a whole when they operate together in a system, in order to achieve optimum conditions that minimize unproductive power consumption; and the use of pipes of relatively low head loss and their maintenance in service. Achieving optimum operating conditions in water supply systems in service is also aided by automatic control of system operation using telesignalling, automatic control and computer control. (Campbell-NWWA)
W74-05093

8G. Materials

PROCEEDINGS OF FOURTH SANITARY ENGINEERING CONFERENCE ON WATER DISTRIBUTION SYSTEMS.
For primary bibliographic entry see Field 5F.
W74-05006

PIPE MATERIALS, COATINGS, AND JOINTS FOR WATER DISTRIBUTION SYSTEMS,
Black and Veatch, Kansas City, Mo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W74-05009

TAPPING, DISINFECTION, AND INSPECTION OF WATER MAINS,
Cedar Rapids Water Works, Iowa.
For primary bibliographic entry see Field 5F.
W74-05011

BOREHOLE SAMPLING OF SATUARATED UNCEMENTED SANDS AND GRAVELS,
Commonwealth Scientific Industrial Research Organization, Syndal (Australia). Div. of Applied Geomechanics.
C. M. Barton.
In: NWWA International Groundwater Symposium on 'Groundwater-the Forgotten Resources', November 20-22, 1973, held at Macquarie University, Sydney, Australia. 14 p, 2 fig, 11 ref.

Descriptors: *Sampling, *Cores, Drilling samples, *Hydrologic data, Soil analysis, Economic feasibility, Aquifer characteristics, Boreholes.
Identifiers: *Borehole sampling, Piston sampler, Open drive sampler, Jet sampler, Extension flap sampler, *In-situ freezing, *Pressure-dewatering, Chemical stabilization.

An outline review of borehole sampling of loose sandy materials for hydrological and water well design purposes is presented. Both standard exploration sampling procedures and more precise special techniques are discussed. A great variety of samplers are described, including open drive samplers; piston samplers (retractable, floating, and fixed); jet samplers; and extension flap samplers. In example circumstances, particularly for uncemented or poorly cemented gravels, it may be necessary to stabilize the strata prior to sampling. Consideration can be given in these cases to in-situ freezing, pressure-dewatering, or chemical stabilization of the strata to produce a truly representative and undisturbed sample. (Hunt-NWWA)
W74-05081

CATHODIC PROTECTION, CONTROL OF EXTERNAL CASING CORROSION,
Shell Oil Co., Midland, Tex.
M. T. Chapman.
Materials Protection and Performance, Vol 12, No 9, p 4-12, September, 1973. 8 fig, 10 ref.

Descriptors: *Wells, *Casing, Corrosion, *Corrosion control, *Cathodic protection, Anode, Cathode, *Texas.
Identifiers: *External corrosion, Rectifiers, Ground beds, Cathodic interference.

External corrosion of well casings, which can cause the loss of a well, has occurred in many areas of the United States. West Texas, a major problem area, has several thousand wells under cathodic protection, the only way to effectively combat external casing corrosion. Amperages needed for protection vary from 1 to as many as 50 amps, and the cost can vary from $3000 to $100,000 or more. Methods for determining the extent of corrosion are discussed, and detailed information on the design and installation of cathodic protection systems is presented. (Staplin-NWWA)
W74-05085

THE INTERPRETATION OF INTERFERENCE TESTS IN NATURALLY FRACTURED RESERVOIRS WITH UNIFORM FRACTURE DISTRIBUTION,
Atlantic Richfield Co., Dallas, Tex.
H. Kazemi, M. S. Seth, and G. W. Thomas.
Society of Petroleum Engineers Journal, Vol 9, No 4, p 463-472, December, 1969. 2 fig, 18 ref.

Descriptors: *Fractures(Geologic), *Oil reservoirs, *Drawdown, *Mathematical models, *Fluid flow, Porosity, Porous media, Pressure, Heterogeneity, Unsteady flow.
Identifiers: Buildup, *Interference tests, Matrix Boundary effects, Warren-Root equations.

Both analytical and numerical solutions are offered to the problem of interpreting interference test results in naturally fractured reservoirs. Analysis is based on the concept of the fractured system as having both matrix porosity and fracture porosity. Radial flow to the wellbore is only through the fracture network and matrix flow is into the fractures. Certain other assumptions are made in arriving at the flow equations. The interference drawdown in an observation well while an adjacent well produced at constant rate was examined for five mathematical models representing a naturally fractured reservoir. The flow equations developed by Warren and Root can be used to interpret interference test data. For early time responses, an equivalent homogeneous model does not adequately depict interference drawdown behavior, but for late time responses results are satisfactory. The effects of well spacing and the magnitude of the interporosity flow parameter are briefly cited. (Gray-NWWA)
W74-05086

INTERPRETATION OF BOUNDARY EFFECTS FROM PUMPING TEST DATA,
Geological Survey, Trenton, N.J. Groundwater Branch.
For primary bibliographic entry see Field 8B.
W74-05089

CORROSION CONTROL SPEEDS UP,
Clark, Dietz and Associates, Urbana, Ill. Environmental Engineering Section.
P. Clinebell.
Water and Wastes Engineering, Vol 10, No 11, p 42-46, November, 1973.

Descriptors: Corrosion, *Corrosion control, *Cathodic protection, *Sulfur bacteria, Electrochemistry, Hydraulic engineering, *Construction materials, Chemical reactions, Coatings, *Pipelines, Water districts.
Identifiers: Regional water districts, Galvanic corrosion, Pressure fluctuation, Water hammer.

Recently Federal agencies have encouraged the regionalization of potable water supplies number and total length of long distance transmission pipelines for both water and wastewater facilities. This trend emphasizes the need to evaluate fully the material of construction for pipelines to assure protection against corrosion. Other factors related to durability such as soil conditions, terrain, and superimposed loads, should be considered in the design of these essential links to satisfactory service. Metallic pipe because of its chemical nature, is subject to interaction with materials it is transporting or the environment to which it is exposed. This interaction while relatively slow with some pipe materials is more rapid with others and results in deterioration or corrosion of the metallic material. Three commonly recognized types of corrosion are: (1) bacterial or biochemical oxidation; (2) galvanic corrosion or dissimilar metal activity in an electrolyte resulting in dissolution of metals from the exterior of the pipelines; (3) electrolysis or electrolytic corrosion by stray currents generated from external sources. The causes of the different types of corrosion and methods to protect against them are discussed in detail. Also discussed are additional areas that need consideration in the construction of long distribution pipelines. (Hunt-NWWA)
W74-05090

HOW AREAL HETEROGENEITIES AFFECT PULSE-TEST RESULTS,
Esso Production Research Co., Houston, Tex.
S. Vela, and R. M. McKinley.
Society of Petroleum Engineers Journal, Vol 10, No 2, p 181-191, June 1970. 10 fig, 2 tab, 6 ref.

Descriptors: *Transmissivity, *Storage coefficient, *Heterogeneity, *Aquifer characteristics, Porous media, Diffusivity, Permeability, Porosity, Mathematical models, Flow.
Identifiers: *Pulse test, Directional correction, Influence area, *Well pair.

Reservoir transmissibility and storage values can be calculated by inducing pressure pulses in one well and measuring them in a second well. The equations used assume a homogeneous formation. Effects are examined of certain idealized types of areal heterogeneities on the calculated values. An influence area (rectangle) is described for the two wells. Only those heterogeneities within this area significantly affect pulse-test results. The manner in which a pulse test averages heterogeneities within the influence area is described for three limiting cases. These are the cases for which one of the three formation properties (hydraulic diffusivity, transmissibility, and storage) is constant throughout the influence area. A method is developed for the correction of pulse-test values of transmissibility and storage. This 'directional correction' method restores some, if not most, of the true degree of heterogeneity to these values (within the limitations of experimental error and model assumptions). (Gray-NWWA)
W74-05092

LEAK DETECTION,
Compagnie Intercommunale Bruxelloise des Eaux (Belgium).
I. M. Chalet.
In: Eighth Congress of the International Water Supply Association, September 1-5, 1969, Vienna, Austria, p O3-O14, (1969). 12 ref.

Descriptors: *Leakage, *Water loss, *Watertight, Distribution systems, Pipes, Linings.
Identifiers: *Leak detection, Radioactive fluids, Gas dilution.

Leaks in a water distribution system can result in economic losses, decreased abundance of water resources, and the possibility of pollution if pressure falls at the location of a leak. Establishing the existence of leaks includes three possibilities: (1) continuous overall supervision of the network by the Water Authority; (2) incidents coming to light from time to time; and (3) systematic detection campaigns along the network by overall or itinerant methods. Special methods using radioactive fluids, gas dilution, and acoustic and electric-acoustic instruments are described. Other information helpful in discovering leak presence and location includes age of network; depth of pipelines; nature and lining of pipelines; and valves, seals, and cocks used. (Staplin-NWWA)
W74-05095

CHART TELLS ANNULAR CIRCULATION PRESSURES,
Continental Oil Co., Houston, Tex.
For primary bibliographic entry see Field 8B.
W74-05096

UNUSUAL CASES OF COPPER CORROSION,
Calgon Corp., Pittsburgh, Pa. Corrosion Research Group.
G. B. Hatch.
Journal American Water Works Association, Vol 53, No 11, p 1417-1428, November 1961. 7 fig, 4 ref.

Descriptors: *Corrosion, *Pitting, *Copper, Aluminum, Iron, Zinc, Oxidation, Chemical reactions.
Identifiers: *Impingement, Cuprous oxide, Carbonized residues.

Copper, like other metals used for potable-water tubing, can be damaged from both general and localized corrosion. A thin, very fine grained film of cuprous oxide normally forms on copper surfaces exposed to potable waters; it is tightly adherent and quite highly protective. The effects of dissolved copper on zinc, iron, and aluminum corrosion are examined. Impingement attack is discussed in some detail, and pitting attack is reviewed for the following systems: cold water lines, hot water lines, domestic service lines, and sprinkler systems. Other causes of pitting, such as carbonized residues, are also discussed. (Campbell-NWWA)
W74-05097

DESIGN AND USE OF RADIAL COLLECTOR WELLS,
California State Dept. of Public Health, Santa Rosa. Bureau of Sanitary Engineering.
For primary bibliographic entry see Field 8B.
W74-05098

WELLBORE TRANSMISSIBILITY FROM AFTERFLOW-DOMINATED PRESSURE BUILDUP DATA,
Esso Production Research Co., Houston, Tex.
R. M. McKinley.
Journal of Petroleum Technology, Vol 23, No 7, p 863-872, July 1971. 13 fig, 6 ref.

Descriptors: *Permeability, Flow, *Graphical methods, *Transmissivity, Curves, Theis equation, Wells, *Pressure, Drawdown, Groundwater reservoirs.
Identifiers: Buildup, *Skin effect, *Afterflow, Fall-off, Shut-in.

Afterflow -- the continued influx of fluid from a formation into the wellbore after the well is shut in -- may furnish useful information. Pressure measurements should be more accurate during afterflow than later. The pressure change during afterflow should reflect a dynamic balance between (1) the capacity of the well to store fluid, and (2) the ease with which the formation supplies fluid to the wellbore (i.e., an indication of transmissibility). By the use of a set of type-curves prepared for pressure buildup in a homogeneous, radially finite reservoir, near-wellbore transmissibility is calculated directly from pressure buildup data without assuming formation properties. The generation and use of the type curves are described. Examples are given of the use of type curves with wellbores having a skin, a low permeability streak, and partial penetration. Five examples are given of the type-curve analysis of field data that were difficult to interpret conventionally. Although the examples relate to buildup tests, the method is applicable to drawdown, fall-off, and injectivity tests. (Gray-NWWA)
W74-05101

SELECTION, HANDLING, AND PROTECTION OF DOWNHOLE MATERIALS: A PRACTICAL APPROACH,
Atlantic Richfield Co., Dallas, Tex.
S. M. Bucaram, H. G. Byars, and M. Kaplan.
Materials Protection and Performance, Vol 12, No 9, p 20-26, September 1973. 5 fig, 4 ref.

Descriptors: Corrosion, *Corrosion control, Economics, *Training, *Engineering personnel, Materials, Pitting, Fatigue.
Identifiers: *Production personnel, *Downhole materials, Corrosion inhibition, Handling-caused failures.

A downhole failure control short course was designed as a means to supply production and engineering personnel with the know-how necessary to reduce subsurface corrosion and handling-caused failures. Specifically discussed were failure due to tension, wear, corrosion (both uniform and pitting), fatigue, methods of corrosion inhibition, and the economics of failure control. A study of equipment performance data fol-

lowing presentation of the short course indicated significant reductions in corrosion and handling-caused failures. (Campbell-NWWA)
W74-05102

ABATEMENT OF MINE DRAINAGE POLLUTION BY UNDERGROUND PRECIPITATION,
Parsons (Ralph M.) Co., Los Angeles, Calif.
For primary bibliographic entry see Field 5G.
W74-05106

COMBINED MILL EFFLUENT GOES TO AERATION POND IN PE (POLYETHYLENE) PIPELINE.
For primary bibliographic entry see Field 5D.
W74-05269

8H. Rapid Excavation

ENVIRONMENTAL ASPECTS OF NATURAL GAS STIMULATION EXPERIMENTS WITH NUCLEAR DEVICES,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 5B.
W74-05184

8I. Fisheries Engineering

COMBINED REARING OF THE PIKE-PERCH LUCIOPERCA LUCIOPERCA (L.) AND ROACH RUTILUS RUTILUS HECKELI (NORDM.) IN LIMAN FISH FARMS OF KUBAN, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
E. P. Tsunikova.
Vopr Ikhtiol. Vol 12, No 6, p 1073-1078, 1972.
Identifiers: *Fish farming, Liman fish farms, Lucioperca-lucioperca, Perch, *Pike-perch, Productivity, Rearing, Reproduction, *Roach, Rutilus-Rutilus-Heckeli, *USSR(Kuban), Fish foods.

Study of the habitats of young pike-perch Lucioperca lucioperca and roach Rutilus rutilus heckeli, degree of similarity of their food, and relative competition showed the expediency of their combined rearing in the estuarine fish farms of Kuban (USSR). With the combined rearing of the young of these fishes the food base is utilized more completely. The rearing of young pike-perch alone does not noticeably increase the effectiveness of its reproduction, but leads to a decrease of the fish productivity of bodies of water.--Copyright 1973, Biological Abstracts, Inc.
W74-04923

HOOD CANAL POND REVISION,
Washington State Dept. of Fisheries, Olympia.
R. Webb.
Available from NTIS, Springfield, Va 22151 COM-72-11198 Price $3.00 printed copy; $1.45 microfiche. Project Completion Report to NOAA, National Marine Fisheries Service, July 1972. 5 p, 3 photo. AFC-53.

Descriptors: *Fish hatcheries, *Washington, *Fish management, Fisheries, *Chinook salmon, Fish handling facilities.
Identifiers: *Fish holding ponds.

The concrete release pond at the Hoodsport Hatchery, Washington, was reconstructed into an adult holding pond so as to permit species segregation. When not in use for adult holding, it is to be used for juvenile rearing of chinook salmon. This is estimated to increase the station production by 15,000 pounds annually. (Knapp-USGS)
W74-05157

LOW PH LEVELS WIPE OUT SALMON AND TROUT POPULATIONS IN SOUTHERNMOST NORWAY,
For primary bibliographic entry see Field 5C.
W74-05356

DISTRIBUTION AND EPIZOOTIOLOGICAL IMPORTANCE OF DACTYLOGYRUS EXTENSUS (MONOGENOIDEA) IN SLOVAKIA (IN CZECH),
For primary bibliographic entry see Field 5C.
W74-05358

ON THE PROBLEM OF HOST SPECIFICITY, RESERVOIR PARASITISM AND SECONDARY INVASIONS OF CAMALLANUS LACUSTRIS (NEMATODA:CAMALLANIDAE), (IN CZECH),
Ceskoslovenska Akademie Ved, Prague. Parazitologicky Ustav.
For primary bibliographic entry see Field 5C.
W74-05359

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

EXPRO '74--A LISTING OF EXTRAMURAL PROJECTS TO BE FUNDED IN FISCAL YEAR 1974.
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5G.
W74-04913

9C. Research Facilities

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1971.
Water Resources Council, Washington, D.C. Sedimentation Committee.
For primary bibliographic entry see Field 2J.
W74-04916

SANTA RITA EXPERIMENTAL RANGE: YOUR FACILITY FOR RESEARCH ON SEMIDESERT ECOSYSTEMS,
Forest Service (USDA), Tucson, Ariz., Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3F.
W74-05227

9D. Grants, Contracts, and Research Act Allotments

EXPRO '74--A LISTING OF EXTRAMURAL PROJECTS TO BE FUNDED IN FISCAL YEAR 1974.
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5G.
W74-04913

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

ADVISORY COMMITTEE ON WATER DATA FOR PUBLIC USE--SUMMARY OF EIGHTH MEETING, JUNE 5-7, 1973, PORTLAND OREGON.
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07C.
W74-04924

10C. Secondary Publication And Distribution

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART I: ABSTRACTS.
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 05G.
W74-05004

A BIBLIOGRAPHY ON LEGAL AND REGULATORY ASPECTS OF WATER POLLUTION CONTROL AND ABATEMENT, PART II: SUBJECT INDEX.
Florida Univ., Gainesville. Coll. of Law.
For primary bibliographic entry see Field 05G.
W74-05005

FUNDAMENTALS OF KARST SCIENCE. VOLUME 2 (OSNOVY KARSTOVEDENIYA. TOM II),
Perm State Univ. (USSR). Inst. of Karst Studies and Speleology.
For primary bibliographic entry see Field 02F.
W74-05017

ANNOTATED BIBLIOGRAPHY ON PRECIPITATION MEASUREMENT INSTRUMENTS,
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 02B.
W74-05169

FOREST PRODUCTS POLLUTION CONTROL -- ANNOTATED BIBLIOGRAPHY (EXCLUDING PULP AND PAPER),
Western Forest Products Lab., Vancouver (British Columbia).
For primary bibliographic entry see Field 05B.
W74-05284

10F. Preparation Of Reviews

KRAFT PULPING EFFLUENT TREATMENT AND REUSE - STATE OF THE ART,
Saint Regis Paper Co., Pensacola, Fla. Research and Development Center.
For primary bibliographic entry see Field 05D.
W74-05110

FUNDAMENTAL VIEW OF THE CLOSED WATER CIRCUIT (DER GESCHLOSSENE WASSERKREISLAUF IN GRUNDSAETZLICHER BETRACHTUNG),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
For primary bibliographic entry see Field 05D.
W74-05282

A REVIEW OF WATER ANALYSIS BY ATOMIC ABSORPTION,
Perkin-Elmer Corp., Norwalk, Conn.
For primary bibliographic entry see Field 05A.
W74-05292

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* U. S. GOVERNMENT PRINTING OFFICE : 1974 O - 542-958

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 7, NUMBER 11
JUNE 1, 1974

W74-05401 -- W74-05950

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 7, NUMBER 11
JUNE 1, 1974

W74-05401 -- W74-05950

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

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ABSTRACT SOURCES

2. WATER CYCLE

2A. General

SIMULATION OF THE HYDROLOGY OF UNGAGED WATERSHEDS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
L. F. Huggins, J. R. Burney, P. S. Kundu, and E. J. Monke.
Available from the National Technical Information Service as PB-229 670, $3.75 in paper copy, $1.45 in microfiche. Purdue University Water Resources Research Center Technical Report No. 38, 1973. 70 p, 20 fig, 3 tab, 6 ref, 1 append. OWRR B-016-IND(2).

Descriptors: *Watersheds(Basins), *Hydrologic models, *Simulation analysis, *Rainfall-runoff relationships, *Small watersheds, *Overland flow, Roughness, Roughness coefficient, Hydrographs, Surface waters, Topography, Slopes, Hydraulics, Mathematical models, Runoff, Physical properties, *Distribution patterns.
Identifiers: Distributed analysis, Distributed parameters, Watershed modelling, Power spectral analysis, Surface roughness, Overload flow.

A watershed model is developed capable of predicting hydrologic behavior of a natural watershed for which data concerning historical relationships between rainfall and runoff events are unavailable. The computer program used to implement the model together with sample data and its output is given in an appendix. The model uses a distributed analysis approach and involves the subdivision of a catchment into a grid of small elemental areas, the mathematical characterization or modelling of the various physical processes occurring within each element and the numerical integration of the responses from each watershed element into a comprehensive description of not only the discharge at the outlet, but of the complete hydrologic response of every element of which the catchment is composed. The primary advantages of the distributed watershed model are its potential for increased accuracy due to its inherent capability to evaluate spatially variable factors within a watershed and its comprehensive description of the total watershed behavior. This latter advantage is of increasing importance in providing a means of evaluating the potential environmental effects of alternate programs for resource development. The primary disadvantage of distributed models is the greatly increased computational effort required to utilize them.
W74-05403

EVAPORATION, INFILTRATION AND RAINFALL-RUNOFF PROCESSES IN URBAN WATERSHEDS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
A. Hossain, J. W. Delleur, and R. A. Rao.
Available from the National Technical Information Service as PB-229 642, $4.00 in paper copy, $1.45 in microfiche. Technical Report No. 41, 1974. 46 p, 35 fig, 13 tab, 41 ref. OWRR B-022-IND(2).

Descriptors: *Urban runoff, *Urban hydrology, *Evaporation, *Infiltration rates, *Rainfall-runoff relationships, *Precipitation excess, Urban drainage, Consumptive use, Energy budget, Evaporation pans, Latent heat, Water balance, Infiltration, Antecedent precipitation, Retention, Soil properties, Unit hydrographs, Model studies, Mathematical models.
Identifiers: van Bavel's evaporation formula, Kohler's evaporation formula, Blaney-Criddle evaporation formula, Blaney-Morin evaporation formula, MIT watershed model, Minnesota watershed model, Holtan watershed model, Multicapacity Basin Accounting Model, Antecedent Retention Index Model, Instantaneous Unit Hydrograph, Non-Linear Deterministic Model, Quasi-Linear Model.

Most rainfall-runoff models use rainfall excess as the input. Testing methods for estimating the rainfall excess, evaluating linear and nonlinear systems models for urbanizing areas, and developing a model of the rainfall excess-direct runoff transfer were the objectives of the study. For evaporation, the van Bavel formula was the best model, however if the meteorological data were unavailable, the Blaney-Morin gave good results. The constant diffusivity form of the unsteady flow equation for the flow in porous media was solved making use of the linear systems approach, and an impulse response function was obtained for the relative soil moisture change. Five models were examined as to their application for urban watersheds. The Antecedent Retention Index Model gave the best estimate of the total rainfall excess and the MIT Model gave the best prediction of the time distribution. A quasi-linear model of the rainfall-runoff transfer was developed. The model was tested by predicting the direct runoff of an urban watershed, from which data were not used for the calibration and the performance was found to be very satisfactory. The data for the study were obtained from eleven urban watersheds in Indiana, Texas, and Illinois.
W74-05405

DETERMINATION OF DISCHARGE-FREQUENCY RELATIONSHIPS UTILIZING NON-LINEAR HYDROGRAPHS AND A MODIFIED RATIONAL FORMULA,
Kansas Water Resources Research Inst., Manhattan.
R. L. Smith, K. E. Larson, and M. G. Berry.
Available from the National Technical Information Service as PB-230 036, $11.25 in paper copy, $1.45 in microfiche. KWRRI Contribution No. 126. September 1973. 165 p, 30 fig, 24 ref. OWRR B-022-KAN(1). 14-31-0001-3283.

Descriptors: *Hydrographs, *Kansas, *Hydrograph analysis, *Flood frequency, Rainfall intensity, Watersheds(Basins), Methodology, Storms.
Identifiers: *Non-linear hydrographs, *Frequency-equivalent storms.

A new methodology for calculating flood frequency relationships is presented. Input data requirements are the normal watershed parameters of length, slope and area plus the point rainfall intensity-duration-frequency curve for the specified geographic location. Initial testing on 60 Kansas basins ranging in size from less than one square mile to more than 1,000 square miles gave results which compared favorably with other available techniques. The methodology provides for the determination of a frequency-equivalent storm having a uniform rainfall excess intensity. This storm is converted to a triangular hydrograph having a frequency-equivalent peak discharge and a base length equal to the time of concentration plus the storm duration. The overall approach has been termed the Frequency-Equivalent Non-Linear Hydrograph (FENLH) method. In Kansas, the rainfall excess intensity of the frequency-equivalent storms was found to follow a log normal distribution. For a given basin, the percentage attenuation in peak flow due to the effect of basin storage was found to be essentially constant at frequency-equivalent conditions. Both the slope (variance) of the probability distribution of log X and the time of concentration are directly related to the rate of change in the watershed resistance parameter (BN). BN is a function of the Reynolds number, but its rate of change is also influenced by basin loss characteristics. A procedure for adapting the method to the determination of flood frequency relations in urban basins is presented. Procedures to be followed in utilizing the FENLH hydrograph parameters in reconstituting variable intensity storms are described.
W74-05406

AN EMPIRICAL MATHEMATICAL MODEL OF AN INTERCONNECTED WATERSHED SYSTEM,
Pennsylvania State Univ., University Park. Dept. of Industrial Engineering.
D. L. Raphael, and B. M. Tallman.
Available from the National Technical Information Service as PB-229 830 $7.00 in paper copy, $1.45 in microfiche. Institute for Research on Land and Water Resources, Pennsylvania State University, research project technical completion report, February, 1974. 72 p, 15 fig, 18 tab, 6 ref. OWRR A-022-PA(1). 14-31-0001-4038.

Descriptors: *Watersheds(Basins), *Mathematical models, Evapotranspiration, Hydrographs, Model studies, Seepage, Flow, *Forecasting, *Hydrograph analysis, *Rainfall-runoff relationships, *Algorithms.
Identifiers: *Response surface mapping, Absorbing sectors, Seepage loss.

The problem of prediction of surface flow hydrographs resulting from excess rainfall was investigated by applying Response Surface Mapping techniques to estimate parameters as a function of time. An empirical model with two absorbing sectors (surface flow and the sun of the evapotranspiration and seepage loss) was developed and applied to a complex system of interconnected watersheds using hypothetical data and parameters. The model techniques were also applied to predict a surface flow hydrograph for a single real world watershed.
W74-05543

SURFACE-GROUNDWATER RELATIONSHIPS IN CENTRAL MONGOLIA (VZAIMOSVYAZ' POVERKHNOSTNYKH I GRUNTOVYKH VOD V TSENTRAL'NOY MONGOLII),
Proizvodstvennyi i Nauchno-Issledovatelskii Institut po Inzhenernym Izyskaniyam v Stroitelstve Gosstroya, Moscow (USSR).
A. F. Krashnikov.
Akademiya Nauk SSSR Izvestiya, Seriya Geograficheskaya, No 5, p 92-96, September-October 1973. 1 fig, 1 tab, 8 ref.

Descriptors: *Surface-groundwater relationships, *Water resources, *Surface waters, *Groundwater, Streamflow, Runoff, Rainfall-runoff relationships, Mountains, Estimating.
Identifiers: *USSR(Mongolia).

Characteristics of surface waters and groundwater in Central Mongolia are examined, and estimates are made of water resources of the area. Large supplies of water, both surface and ground, are concentrated in the Hangayn-Henteyn (Kentei Shan) folded mountain region. Natural groundwater resources drained by the hydrographic network of rivers in the region are 6.6 cu km/yr, which is 30% of the local streamflow estimated at 22.1 cu km/yr. The Selenge and Onon basins, which occupy 58% of the area of the Hangayn-Henteyn fold mountains, contain three-fourths (4.68 cu m/yr) of the groundwater resources of this most water-abundant region of Mongolia. The groundwater contribution to streamflow in the Hangayn-Henteyn mountains, including the Selenge (Arctic Ocean) basin, the Pacific Ocean basin, and closed basins of Central Asia is tabulated. (Josefson-USGS)
W74-05561

WATERSHED MODELS: TOOLS IN PLANNING LAND MANAGEMENT FOR WATER AND POLLUTION CONTROL,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
C. B. England.

Journal of Soil and Water Conservation, (Vol 28), p 36-38, January-February 1973. 4 chart, 2 illus, 4 ref.

Descriptors: *Water, *Land management, *Hydrologic data, *Model studies, *Hydrologic models, Water utilization, Evapotranspiration control, Non-structural alternatives, Watershed management, Zoning, Watersheds(Basins), Agricultural watersheds, Groundwater basins, Analytical techniques, Research and development.

All phases of the hydrologic cycle are involved in the disposition of wastes on agricultural land. Infiltration, storage, movement of water in the soil, surface detention and runoff, evapo-transpiration, groundwater recharge and channel processes all influence the fate of any material applied to a soil. Because of the complex interdisciplinary nature of predicting watershed performance, comprehensive mathematical models have been developed in agricultural hydrology. Through manipulation of parameters controlling the prediction computations, quick and efficient evaluation of potential effects of management alternatives can be made, thus optimizing the design of control measures to achieve a specified result. These models can provide aid to understanding and predicting water movements within agricultural watersheds. Since they can be employed to determine the movement of dissolved or suspended pollutants, if they are constructed in such a way that land management effects are predictable, they can become a useful tool in pollution control planning. (Ritchie-Florida)
W74-05570

DEVELOPING SIMULATION MODELS,
McMaster Univ., Hamilton (Ontario). Dept. of Civil Engineering and Engineering Mechanics.
W. James.
Water Resources Research, Vol 8, No 6, p 1590-1592, December, 1972. 3 fig, 1 ref.

Descriptors: *Mathematical models, *Computer models, *Systems analysis, *Model studies, *Simulation analysis, Operations research, Synthetic hydrology, Scheduling.

Simulation models are commonly resolved in time and space beyond the integrity of available field observations. Input data are judged accordingly, and, ultimately, expensive simulation models coexist with inadequate data bases. Such manipulation is necessary in sensitivity analysis, but a compromise between data collection and model extrapolation must be found. The rationale for the systematic development of a simulation model and the concomitant data collection program is presented and should be useful for managing difficult simulation studies. (Skogerboe-Colorado State)
W74-05672

ROLE OF MODELS IN GROUNDWATER MANAGEMENT,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 4B.
W74-05680

SPECTRAL ANALYSIS AND ITS APPLICATION TO HYDROLOGIC TIME SERIES OF LOWER OHIO TRIBUTARIES,
Purdue Univ., Lafayette, Ind.
H. L. Shahabian.
Available from National Technical Information Service as PB-230 241, $9.75 in paper copy, $1.45 in microfiche. Thesis, 1973, 118 p, 24 fig, 10 tab, 22 ref, append. OWRR-B-036-IND(3).

Descriptors: *Rainfall-runoff relationships, *Simulation analysis, *Stochastic processes, *Time series analysis, Precipitation, Rain, Runoff, Hydrographs, Evapotranspiration, Probability, Mathematical studies, *Ohio River, *Regression analysis.
Identifiers: *Spectral analysis.

Objectives were to develop different models for the rainfall and runoff sequences and of rainfall-runoff processes for several watershed tributaries to the Ohio River. The models developed for the monthly data followed two different approaches, namely, spectral analysis and the ARIMA (autoregressive integrated moving average) procedure. Spectral analysis is applied to develop a model for the monthly runoff sequence. The autoregressive scheme is adequate to represent the normalized standardized monthly sequences. A comparison of the spectral and parametric estimation of the model parameters is performed for their respective generating capabilities. The monthly rainfalls are analyzed using the same spectral technique. The normalized standardized series do not differ sensibly from a white noise or uncorrelated random variables. The rainfall-runoff relationship is analyzed by the cross-spectral technique and it is found that the linear system for the two series does not explain the relationship adequately.
W74-05820

MODELS OF SPRING RUNOFF FORMATION AND PROBLEMS IN THEIR USE FOR FORECASTING THE FLOOD HYDROGRAPH,
Gidrometerologicheskii Institut, Leningrad (USSR).
A. P. Zhidikov, A. G. Levin, N. S. Nechayeva, and Ye. G. Popov.
Soviet Hydrology: Selected Papers, No 3, p 240-249, 1972. 3 fig, 5 ref. Translation of Transactions of the Hydrometeorological Research Center of the USSR (Trudy GMTs), No 81, p 33-45, 1972.

Descriptors: Model studies, *Flood forecasting, *Hydrograph analysis, *Snowmelt, *Runoff, Water equivalent, Hydrologic budget, Inflow, Discharge(Water), Variability, Equations.
Identifiers: *USSR(Oka River), Nomograms, *USSR(Neya River).

Although several models have been developed in the USSR in the last 15-20 years for computation of individual items in the hydrologic budget and of the hydrograph as a whole, they have not found wide application in hydrologic computations and forecasts. A method is investigated for forecasting a flood hydrograph by computing snowmelt at the outlet gaging station of a drainage basin, 4,000 to 6,000 sq km in area. Models were tested on initial data for the Oka River upstream from Orel and for the Neya River upstream from Buslayevo village for 1949-65 and 1936-65, respectively. The drainage area of the Oka River is 4,900 sq km; it is well drained by a ravine-gully network and is unwooded. The drainage area of the Neya River is 5,700 sq km and is 80% covered by forests. The flood hydrograph was derived by computer according to programs designed for 4 modifications of the models. In one modification the rate of snowmelt was computed for open and wooded parts of the basins from snowmelt coefficients. In three modifications the rate of snowmelt in the forest was computed from the snowmelt coefficient, and the rate of snowmelt in the open, from formulas. These modifications further took into account the regulation of temporary meltwater runoff on the basin surface. (Josefson-USGS)
W74-05842

THE ROLE OF SOIL WATER IN THE HYDROLOGIC BEHAVIOR OF UPLAND BASINS,
Georgia Univ., Athens. School of Forest Resources.
For primary bibliographic entry see Field 2G.
W74-05913

2B. Precipitation

MANUAL FOR ESTIMATION OF PROBABLE MAXIMUM PRECIPITATION.
World Meteorological Organization, Geneva (Switzerland).
Operational Hydrology Report No 1, 1973. 190 p, 2 append.

Descriptors: *Probable maximum precipitation, *Estimating, Meteorology, Cloud physics, Statistical methods, Depth-area-duration analysis, *Precipitation intensity, Weather data, *Publications, *Climatic data.

Procedures for estimating probable precipitation (PMP) cannot be standardized as they vary with amount and quality of data available, basin size and location, basin and regional topography, storm types producing extreme precipitation, and climate. This manual discusses procedures that have been found generally applicable in the middle latitudes for basin sizes up to about 50,000 sq km in orographic and nonorographic regions. The examples given cover estimates for specific basins and generalized estimates, and include PMP estimates for thunderstorms, general storms, and tropical storms. All procedures described except one are based on the meteorological, or traditional, approach. The one exception is a statistical procedure. The traditional approach consists essentially of moisture maximization and transposition of observed storms. Wind maximization is sometimes used. Storm transposition involves adjustments for elevation, moisture-inflow barriers, and distance from the moisture source. These adjustments are founded on hypothetical storm models. A variation of the traditional approach is the use of an orographic computation model in mountainous regions. Methods are described for determining the seasonal variation and chronological and areal distribution of PMP. Tables of precipitable water in a saturated pseudoadiabatic atmosphere are included for making various adjustments involving atmospheric moisture. Also included are world record and near-record rainfalls that may be used for making rough assessments of derived PMP estimates. (Knapp-USGS)
W74-05524

DESCRIPTION OF PRECIPITATION CYCLES IN THE USSR AND THEIR RELATION TO GENERAL CIRCULATION CYCLES,
O. A. Drozdov, and A. S. Grigor'yeva.
Soviet Hydrology: Selected Papers, No 1, p 57-64, 1972. 4 fig, 6 tab, 6 ref. Translated from Third All-Union Conference on General Circulation of the Atmosphere (Trudy 3-ey Vsesoyuznoy konferentsii po obshchey tsirkulyatsii atmosfery), p 87-96, 1972.

Descriptors: *Precipitation(Atmospheric), *Air circulation, *Cycles, Correlation analysis, Seasonal.
Identifiers: *USSR.

Statistical structure of time series of atmospheric precipitation over large areas of the USSR was investigated for territorial distribution of cycles and its correlation with similar air circulation characteristics. Data of 77 stations for 1891-1960 for cold (November-March) and warm (April-October) periods of the year were used. Cycles at 4 stations (Leningrad, Tbilisi, Barnaul, and Nerchinskiy Zavod) were investigated for 1830-90. A 2- to 3-year cycle is generally observed in both precipitation and circulation. A 6- to 7-year cycle is encountered more often in precipitation than in circulation (particularly during the warm period), while 8- to 9- and 10- to 11-year cycles frequently associated with circulation are replaced by 9- to 10- and 12- to 13-year precipitation cycles. A 14- to 15-year cycle is observed in both precipitation and circulation, and cycles of 19 and 20 to 22 years are better defined in precipitation than in circulation characteristics. A cycle of 60 to 80 years is as-

sociated with both circulation and precipitation. Cycles are more clearly defined in the amount of precipitation. The contribution of cycle components to long-period variations in the amount of precipitation is significant. (Josefson-USGS)
W74-05566

RELATIONSHIP BETWEEN CLIMATOLOGICAL VALUES OF AIR TEMPERATURE AND AMOUNT OF PRECIPITATION,
K. V. Pyatygina.
Soviet Hydrology: Selected Papers, No 1, p 18-21, 1972. 1 fig, 1 tab, 7 ref. Translated from Voyeykov Main Geophysical Observatory (Trudy GGO), No 273, p 61-65, 1972.

Descriptors: *Climatology, *Meteorology, *Precipitation(Atmospheric), *Air temperature, Correlation analysis.
Identifiers: *USSR.

Correlations between long-period average temperature and precipitation values and between their anomalies reflect the general mechanism of climate formation. Since the coefficients of correlation between temperature and precipitation anomalies were found to be much lower than between long-period average values of these meteorological elements, it may be assumed that the results obtained for normal values are conclusive in this mechanism of climate formation, while those obtained for anomalies are a peculiar manifestation of this mechanism. This factor must be considered in developing a climatic theory. (Josefson-USGS)
W74-05568

CLIMATIC DESCRIPTION OF DEW IN THE EUROPEAN USSR,
Main Geophysical Observatory, Leningrad (USSR).
V. N. Karpenko.
Soviet Hydrology: Selected Papers, No 3, p 264-268, 1972. 3 fig, 1 tab, 3 ref. Translation of Transactions of the Voyeykov Main Geophysical Observatory (Trudy GGO), No 288, p 150-155, 1972.

Descriptors: Climatology, *Dew, *Air temperature, Maps, *Time series analysis, *Climatic data.
Identifiers: *European USSR, *Isolines.

Average dates of the beginning and end of dew formation from 1959 to 1965 were calculated from results of daily observations at 100 stations in different regions of European Russia. To estimate the reliability of the 7-year series, dates of the beginning and end of dew formation were calculated for 11 stations for a 20-year period (1950-69). Relations were established between average dates of dew formation and average daily air temperature on the data of dew formation and between duration of the period of possible dew formation and dates of its beginning and end. In northern and northwestern regions dew begins to form as air temperature crosses 7-8 deg C. In Estonia, Latvia, Belorussia, most of the Ukraine, and central and eastern regions of European Russia, it forms at 5-6 deg C. In Lithuania, Moldavia, and the Stavropol' and Krasnodar Territories dew begins to form when air temperature crosses 3-4 deg C. The greatest difference between the average dates of dew formation observed over a 20-year period and the calculated dates is 4 days, and that between the dates of the end of dew formation is 6 days. The difference between the actual and calculated duration of the period of possible dew formation is 9 days. In northern regions, the average duration of the period of possible dew formation is approximately 120 days, beginning in late May and ending during the last 10 days of September. The duration of this period increases southward, reaching 240 days in the southern Ukraine and Northern Caucasus. Average duration of the possible period of dew formation and dates of its beginning and end are tabulated for 11 stations in European Russia, and average duration of the possible period of dew formation and dates of its beginning and end are mapped. (Josefson-USGS)
W74-05839

AMOUNT OF DEW IN THE USSR, ACCORDING TO A DEW RECORDER,
Main Geophysical Observatory, Leningrad (USSR).
V. N. Karpenko.
Soviet Hydrology: Selected Papers, No 3, p 260-263, 1972. 1 fig, 1 tab, 12 ref. Translation of Transactions of the Voyeykov Main Geophysical Observatory (Trudy GGO), No 288, p 144-149, 1972.

Descriptors: *Dew, Measurement, Climatic data, Distribution patterns.
Identifiers: *USSR, *Dew gages.

To exclude the effects of varying duration of the warm season at different latitudes, the amounts of dew in the USSR were calculated for a 5-month period from May through September. The largest amount of dew, about 4-6 mm, is observed in the Baltic States, the Pskov, Novgorod, and Leningrad Oblasts, Belorussia, the Upper Volga Region, and in the western Ukraine. The amount of dew decreases markedly from northwest to southeast in European Russia. In the Central Russian Uplands, the southeastern Ukraine, the Stavropol' and Krasnodar Territories, and in Rostov Oblast, the amounts of dew measured by a dew gage in May-September are about 2-3 mm. Dew values decrease to 1 mm over most of the lower Volga Region but increase considerably on the Black Sea coast of the Caucasus and in foothills of the Northern Caucasus. The amount of dew in Tadzhikistan in May-September is 2 mm. In the Lena Valley of the Yakutsk ASSR, dew values reach 2-3 mm. In Chita, Irkutsk, Ulan-Ude, and Krasnoyarsk dew yields 3-4 mm of water. Dew in the Maritime Territory in May-September yields as much as 5-6 mm of water. In most cases, average daily dew precipitation in the USSR is about 0.1 mm. Annual dew precipitation in the Baltic States, Belorussia, most of the Ukraine, and in central regions of European Russia is 8-12 mm, and in Upper and Central Volga Regions and Stavropol' and Krasnodar Territories it is 6-8 mm. North of 60 deg N and in the Lower Volga Region dew values decrease to 3-5 mm. The geographic distribution of dew in May-September over the USSR (in mm) is mapped, and the average number of days with dew per year is tabulated for 34 stations in the country. (Josefson-USGS)
W74-05840

PROBLEM OF DETERMINING PRECIPITATION FALLING ON MOUNTAIN SLOPES,
Main Geophysical Observatory, Leningrad (USSR).
L. R. Struzer.
Soviet Hydrology: Selected Papers, No 2, p 129-142, 1972. 5 fig, 5 tab, 1 ref. Translation of Transactions of the Voyeykov Main Geophysical Observatory (Trudy GGO), No 280, p 134-149, 1972.

Descriptors: *Precipitation(Atmospheric), *Rainfall disposition, *Raindrops, *Slopes, *Mountains, Valleys, Watersheds(Divides), Winds, Rain gages, Equations.

Quantitative criteria were established for dimensions of a mountain basin, and methods were developed for computing differences in precipitation occurring on opposite slopes of a mountain valley. Three different planes in space were investigated: horizontal, sloping, and perpendicular to the trajectory of drops. The quantitative estimates obtained can be used in piedmont regions and in areas with smooth, streamlined landforms. In high mountain areas, the degree of deviation of the trajectories of the actual field from rectilinear and parallel precipitation trajectories must be considered. This deviation will determine the degree of representativeness of precipitation stations. Intersection of rain trajectories by planes of different slope and orientation is diagrammed, and maximum difference in amounts of precipitation received by right and left slopes of a valley is tabulated. (Josefson-USGS)
W74-05843

2C. Snow, Ice, and Frost

NITROGEN FIXATION IN A SUBARCTIC MIRE,
Kungliga Lantbrushogskolan, Uppsala (Sweden).
For primary bibliographic entry see Field 5B.
W74-05489

MICROWAVE RADIATION CHARACTERISTICS OF DRY AND MOIST GROUND COVERS,
A. E. Basharinov, L. F. Borodin, S. T. Egorov, and A. M. Shutko.
Available from NTIS, Springfield, Va 22151 as N73-26153 Price $3.00 printed copy; $1.45 microfiche. Typescript, 1973, 9 p, 4 fig, 4 ref. NASA Translation TT F-14975. NASA Contract NASw-2484.

Descriptors: *Remote sensing, *Microwaves, *Satellites(Artificial), Forest fires, Soil moisture, Temperature, Ice, Groundwater.
Identifiers: USSR.

Microwave measurements from space can be used to detect fires, measure soil moisture and temperature, measure sub-ice soil temperatures and the thickness of ice cover, and in the search for subsurface water. (Knapp-USGS)
W74-05558

ON A MODEL OF THE ICE BREAKUP PROCESS,
L. G. Shulyakovskiy.
Soviet Hydrology: Selected Papers, No 1, p 21-27, 1972. 2 tab, 4 ref. Translated from Transactions of Hydrometeorological Center (Trudy GMTs), No 49, p 3-10, 1972.

Descriptors: *Model studies, *Ice breakup, *Ice, *Ice cover, *Ice-water interfaces, Stress, Pressure, Friction, Velocity, Roughness(Hydraulic), Roughness coefficient, Equations.
Identifiers: *USSR.

Stresses in ice cover are produced by: (1) friction between water and the bottom surface of ice cover; (2) friction between air and the top surface of ice cover; (3) pressure of water flow on the submerged face of ice cover; (4) pressure of air flow on the ice face projecting above the water surface; and (5) wave motion. The main force producing stresses in ice cover which result in ice breakup is friction between water flow and the bottom surface of ice cover. Stresses arising in ice cover can be tensile, compressive, shearing, or bending. The predominant type of stress depends on the tortuosity of the river. Tables show the magnitude of friction forces between water and the bottom face of ice cover and between wind and the top face of ice cover, in sq m of ice surface. (Josefson-USGS)
W74-05567

METHOD FOR SUPPRESSING THE FORMATION OF ICE IN NATURAL OR MAN-MADE BODIES OF WATER,
Dow Chemical Co., Midland, Mich. (assignee).
J. S. Best.
U.S. Patent No. 3,768,264, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 915, No 5, p 1616, October 30, 1973.

Descriptors: *Patents, Ice, *Heat transfer, *Heat exchangers, Equipment, Iced lakes, *Navigation.
Identifiers: *Ice formation suppression.

A method for suppressing the formation of ice in natural or man-made bodies of water such as lakes, rivers, sound, straits, bays, shipping canals, shipping locks, harbors, and the like is described. The method is particularly useful in areas where ice breakers or the like cannot be efficiently operated. The method provides for direct replacement of heat lost to the atmosphere during the winter season by the use of heat transfer means such as permanent heat transfer apparatus located in and/or adjacent the sides of canals or rivers to prevent natural bridging of ice formation in them or by use of a traveling heat exchanger placed in a barge, scow, or similar vessel. The method provides for the direct replacement of heat lost to the atmosphere from a body of water during cold seasonal days when the air temperature is below that necessary for the formation of an ice cover. This replacement of heat results in maintaining the upper layer of water in the body of water just above freezing. This invention takes advantage of low level thermal energy sources by using liquid compositions to store heat near the body of water. (Sinha - OEIS)
W74-05689

WATER-LEACHABLE NUTRIENTS FROM FROZEN OR DRIED PRAIRIE VEGETATION,
South Dakota State Univ., Brookings. Dept. of Plant Science.
For primary bibliographic entry see Field 5B.
W74-05696

RATES OF QUATERNARY GLACIAL EROSION AND CORRIE FORMATION, MARIE BYRD LAND, ANTARCTICA,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 2J.
W74-05717

WATER RELEASE FROM THE BASE OF ACTIVE GLACIERS,
Windsor Univ. (Ontario). Dept. of Geology.
M. Stupavsky, and C. P. Gravenor.
Geological Society of America Bulletin, Vol 85, No 3, p 433-436, March 1974. 1 fig, 5 tab, 13 ref.

Descriptors: *Glaciers, Movement, *Till, Muds, Melt water, Melting, Glaciology, Slurries, Glaciohydrology, *Canada.
Identifiers: *Port Stanley Till(Can), *Magnetite.

From work done to demonstrate the plausibility of a water layer at the base of active glaciers, it is concluded that the rapid movement of some glaciers and ice sheets can only be explained by the reduction of shear stress of the ice caused by a layer or pockets of water. To test this idea, ground-up till was mixed with varying amounts of water and the alignment of the particles was measured in the Earth's magnetic field. The laboratory results were compared with those obtained from the Port Stanley Till. At the time of deposition of the Port Stanley Till, the material under the ice consisted of a slurry composed of rock and mineral particles with about 28% to 47% water by weight. The long axes of the coarse magnetite retain an alignment which was developed by ice movement either englacially or in the slurry at the ice-till interface. The fine magnetite fraction is free to rotate during deposition. The slurry at the base of the ice acts as a lubricant. This study substantiates the concept of basal sliding caused by continuous release of water from the base of active glaciers. (Knapp-USGS)
W74-05728

THE MODIFICATION OF GREAT LAKES WINTER STORMS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 3B.
W74-05732

RIVER-ICE PROBLEMS: A STATE-OF-THE-ART SURVEY AND ASSESSMENT OF RESEARCH NEEDS.
American Society of Civil Engineers, New York. Hydraulics Div.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY1, Paper 10281, p 1-15, January 1974. 4 fig, 36 ref.

Descriptors: *Ice, *Ice breakup, *Ice jams, Ice loads, Rivers, *Reviews, Frazil ice, Freezing, Streams, Glaciers, Heat budget, Melting, Sedimentation, *Surveys, *Research priorities.
Identifiers: *River ice, Research needs.

The problems associated with river ice are examined, the current state-of-the-art is reviewed, and recommendations for future research are made. The highest research priorities are assigned to the topics of formation processes of river ice, ice jams, ice forces, and heat exchange processes and the effects of thermal enrichment. A number of other problems that merit attention are delineated and include ice formation on submerged surfaces, properties of ice, friction factors, sediment transport in rivers with ice, design of water intakes for ice conditions, formation of icings and riverglaciations, glacial outbursts, and ice formation at navigation locks. (Knapp-USGS)
W74-05824

ESTIMATE OF THE ACCURACY OF DETERMINATION OF SNOW COVER CHARACTERISTICS AND RECOMMENDATIONS ON THE RATIONALIZATION OF THE SNOW MEASUREMENT NETWORK,
Main Geophysical Observatory, Leningrad (USSR).
I. D. Kopanev.
Soviet Hydrology: Selected Papers, No 2, p 122-128, 1972. 6 tab, 10 ref. Translation of Transactions of the Voyeykov Main Geophysical Observatory (Trudy GGO), No 280, p 54-63, 1972.

Descriptors: *Estimating, *Snow cover, *Snow surveys, *Measurement, Depth.
Identifiers: *USSR, Snow courses, Snow density.

Errors in the determination of average snow depth and density were computed from results of experimental snow surveys performed at a selected network of stations at the time of maximum snow accumulation and at the start of snowmelt. To estimate errors, data were analyzed separately for open and sheltered areas. The absolute error in snow depth measurement is small, even in the field, and does not exceed 4 cm, except in southern zones of European Russia where snow cover is unstable and in Kazakhstan where the error exceeds 5 cm. For similar snow survey parameters, the error is much smaller in forested areas than in the open. For most zones in Siberia the absolute error is approximately of the same order of magnitude in both field and forest. Absolute and relative errors depend on the number of measurement points, the error decreasing as the number of points and length of snow course increase. Snow depth interpolation errors are greater for sheltered than for open areas. The interpolation error increases markedly in both open and sheltered areas as the time interval between snow measurements increases. The interpolation error of snow depth and, correspondingly, of the density of the snow measurement network are determined by space-time variations of snow cover. On the basis of computations, recommendations can be made with respect to selection of optimum snow survey parameters and conduct of snow observations at stations and posts of the hydrometeorological network in lowland regions of the USSR. (Josefson-USGS)
W74-05844

AIRBORNE MEASUREMENT OF SNOW-WATER EQUIVALENT USING NATURAL GAMMA RADIATION OVER SOUTHERN ONTARIO, 1972-1973,
Geological Survey of Canada, Ottawa (Ontario).
H. S. Loijens, and R. L. Grasty.
Canada Department of the Environment, Ottawa Inland Waters Directorate Scientific Series No 34, 1973. 21 p, 13 fig, 16 tab, 25 ref, append.

Descriptors: *Remote sensing, *Snowpacks, *Snow surveys, *Water equivalent, *Canada, Nuclear moisture meters, *Gamma rays, Radioisotopes, Calibrations, Measurement.

To test airborne measurement of snow-water equivalent, four gamma-ray spectrometer surveys each 1,850 km in length, were carried out using a sodium iodide detector assembly, flown at 150 m altitude, in an aircraft fitted with a radar altimeter and Doppler navigation system. Total radioactivity, potassium, and thorium were recorded digitally on magnetic tape and were used to calculate an average snow-water equivalent for 16 km sections along each flight line. The results were compared with the measurements from 40 snow courses and 10 experimental courses established along the flight lines. Soil moisture corrections from measurements at selected sites were found to decrease the calculated snow-water equivalent by an average of 2.6 cm for potassium and 3.3 cm for total count. Background radiation measurements were also important because of large fluctuations in atmospheric bismuth-214. An average absolute difference of 0.9 cm water equivalent was found between the potassium airborne and the ground results for the experimental courses. This indicated that the potassium channel can be used without making prior calibration flights at different altitudes to determine the air absorption coefficient. A larger variation of 2.1 cm between the total count and ground results suggests that calibration flights are necessary. (Knapp-USGS)
W74-05853

DIFFERENTIAL TOLERANCE OF SOME ARID-RANGE WHEATGRASSES TO SNOW MOLD,
Agricultural Research Service, Logan, Utah.
For primary bibliographic entry see Field 2I.
W74-05927

2D. Evaporation and Transpiration

EVAPORATION, INFILTRATION AND RAINFALL-RUNOFF PROCESSES IN URBAN WATERSHEDS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 2A.
W74-05405

DEVELOPMENT OF PREDICTION RELATIONSHIPS FOR WATER REQUIREMENTS WITH IRRIGATION COOLING,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 3F.
W74-05539

WATER-USE EFFICIENCY AND ITS RELATION TO CROP CANOPY AREA, STOMATAL REGULATION AND ROOT DISTRIBUTION,
Kansas Agricultural Experiment Station, Manhattan, Evapotranspiration Lab.
For primary bibliographic entry see Field 3F.
W74-05621

SOME EVIDENCE OF STOMATAL RESTRICTION OF EVAPORATION FROM WELL-WATERED PLANT CANOPIES,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
W. Shepherd.
Water Resources Research, Vol 8, No 4, p 1092-1095, August, 1972. 4 fig, 2 tab, 10 ref.

Descriptors: *Evapotranspiration, *Stomata, Water requirements, Soil-water-plant relationships, Consumptive use, Hydrologic cycle, Soil moisture, Moisture, Water conservation, Canopy, Cover crops, *Evaporation.

Various aspects of stomatal control of evaporation and their practical significance have been considered in a recent exchange of opinions. Some considerable departures from potential evaporation rates observed under conditions of generous soil water supply are described. These departures occurred on days of high potential rates and represented reductions of up to about 20% from levels that might otherwise have been expected under the prevailing atmospheric conditions. However, the reductions represented only a few percent of the seasonal or annual evaporation. Accompanying symptoms of plant moisture stress are discussed. (Skogerboe-Colorado State)
W74-05662

WATER-YIELD RELATIONS FOR NON-FORAGE CROPS,
New South Wales Dept. of Agriculture, Leeton (New South Australia). Agricultural Research Station.
For primary bibliographic entry see Field 3F.
W74-05665

INFLUENCE OF HYDROGEN FLUORIDE FUMIGATION ON THE WATER ECONOMY OF SOYBEAN PLANTS,
Purdue Univ., Lafayette, Ind. Dept. of Horticulture.
For primary bibliographic entry see Field 3F.
W74-05838

THE ACTUAL EVAPOTRANSPIRATION OF FOUR FOREST STANDS IN THE EAST OF FRANCE, (IN FRENCH),
Centre National de Recherches Forestieres, Nancy (France). Station de Sylviculture et de Production.
G. Aussenac.
Ann Sci For. Vol 29, No 3, p 369-389. 1972. Illus. English summary.
Identifiers: Abies-grandis, Advection, Carpinus-betulus, Diurnal, Equations, *Evapotranspiration, Fagus-sylvatica, *Forests, *France, Moisture, Nocturnal, Picea-abies, Pinus-sylvestris, Rainfall, Soil, Transpiration, *Pine, *Spruce, *Fir, *Hardwood.

The actual evapotranspiration (ETR) of 4 forest stands, a Scotch pine (Pinus sylvestris), a spruce (Picea abies), a fir (Abies grandis) and a hardwood stand (Fagus sylvatica + Carpinus betulus) was studied in 1967-1969. These high forests had a regular structure and are located upon a marbled and lixiviated brown soil with a seasonal watersheet (at 60 cm depth). Evapotranspiration was estimated between periods at which soil moisture reaches the field capacity (start and end of the vegetation period). The basic equation of the method is: ETR = Pi - D plus or minus delta N, Pi = incident rainfall on the stand, D = lateral and vertical drainage, delta N = level fluctuations of the perched watersheet. Diurnal and nocturnal watertable fluctuations measured in piezometric pipes allowed drainage estimations. The spruce stand evapotranspirated less than the other stands. Different age, different structure and different environmental conditions (advection) caused differences in ETR among the stands. Rainfall interception must also be considered, as the net loss of water can be quite different according to the species and the stand structure. The actual evapotranspiration is higher or equal to the potential evapotranspiration calculated with the Boucher equation. Under temperate climates and soils closed stands of similar age and structure have almost the same actual evapotranspiration.--Copyright 1973, Biological Abstracts, Inc.
W74-05942

2E. Streamflow and Runoff

DETERMINATION OF DISCHARGE-FREQUENCY RELATIONSHIPS UTILIZING NON-LINEAR HYDROGRAPHS AND A MODIFIED RATIONAL FORMULA,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 2A.
W74-05406

METAMORPHOSIS OF A RIVER--A COMPARISON OF THE MISSISSIPPI RIVER BEFORE AND AFTER CUTOFFS,
Army Engineer District, Vicksburg, Miss. Potamology Section.
B. R. Winkley.
Available from the National Technical Information Service as PB-229 648, $5.50 in paper copy, $1.45 in microfiche. Mississippi State University Water Resources Research Institute Publication, 1973. 42 p, 28 fig, 10 tab, 13 ref. OWRR A-999-MISS(9b).

Descriptors: *Mississippi River, *Channel morphology, Channel improvement, Alluvial channels, Sediment transport, Sedimentation, Meanders, Braiding.

The efficiency of the Mississippi River is lower than it was in 1950 and the river is possibly even less efficient than it was as a natural unimproved river. Structures have been placed according to the availability of funds and wherever the need was the greatest. Therefore, even if a perfect plan of alignment and improvement had been designed, it could not have been executed. The geometry of the river has changed fast in response to the numerous cutoffs. The result is a poorly aligned river that has lost flood efficiency, proper sediment transport, and possibly some navigation control. The long-term response of the river is the important factor to consider. Raising levees may only help to aggravate the present trend; alignment, flow condition, and sediment transport and storage, as well as a deep navigation channel, must also be considered. (Knapp-USGS)
W74-05414

SOURCES AND MOVEMENTS OF WATER--AN INTERIM REPORT.
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 2L.
W74-05415

HOUSTONHANNEL, GALVESTON BAY, TEXAS: REPORT 1--HYDRAULIC AND SALINITY VERIFICATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W74-05531

CAESIUM-137 AS A WATER MOVEMENT TRACER IN THE ST GEORGE'S CHANNEL,
Institute of Oceanographic Sciences, Birkenhead (England).
T. R. S. Wilson.
Nature, Vol 248, No 5444, p 125-127, March 8, 1974. 1 fig, 2 tab, 8 ref.

Descriptors: *Tracers, *Currents(Water), *Ocean circulation, Ocean currents, Oceanography, Hydrography, Path of pollutants, Dissolved solids.
Identifiers: *St George's Channel, *Irish Sea.

The distribution of Cs-137 in the St George's Channel of the Irish Sea system shows that the residual (nontidal) flow is slightly lower than indirect estimates suggest. The constribution of turbulent mixing to the transport of dissolved and particulate material in these waters may also be calculated directly from cesium measurements. (Knapp-USGS)
W74-05555

TWO-DIMENSIONAL ANALYSIS OF BACKWATER AT BRIDGES,
University of South Florida, Tampa. Dept. of Structures, Materials, Fluids.
J. T. Franques.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY3, Paper 10403, p 379-392, March 1974. 7 fig, 11 ref, append.

Descriptors: *Backwater, *Mathematical models, *Open channel flow, *Finite element analysis, Flow around objects, *Bridges, Steady flow, Model studies.

A two-space-dimensional mathematical model computes steady flow distributions and water levels near contractions in natural waterways. The two-dimensional model provides a theoretical basis for such one-dimensional concepts as expansion losses by accounting for all losses by friction along properly located two-dimensional streamlines. The finite element solution algorithm locates these streamlines and integrates energy loss due to friction along them. Stagnation zones downstream from contractions can be predicted and located. A necessary condition for separation is that the velocity head at the point of separation exceeds head loss due to friction along some possible path for a free streamline. The absence of separation which is associated with scouring currents along the downstream side of bridge approach embankments can be predicted where the necessary condition is not satisfied. (Knapp-USGS)
W74-05734

URBAN FLOOD FREQUENCY CHARACTERISTICS,
Espey, Huston and Associates, Inc., Austin, Tex.
W. H. Espey, Jr., and D. E. Winslow.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY2, Paper 10352, p 279-293, February 1974. 5 fig, 9 tab, 19 ref, append.

Descriptors: *Urban hydrology, *Storm runoff, *Peak discharge, Urban runoff, Flood recurrence interval, Rainfall-runoff relationships, *Texas, Infiltration, Runoff, Urbanization, *Flood frequency, Flood forecasting.
Identifiers: *Urban watersheds.

On four urban watersheds located in Texas, urbanization has significantly increased peak discharge as much as 200%. However, data on the Waller Creek watershed (Austin, Tex.) and Wilbarger Creek watershed (near Austin, Tex.) suggest that the effects of urbanization on peak discharge decreases above a recurrence interval of 2-5 years. Data from 27 urban watersheds in Texas, combined with 33 urban watersheds located in Virginia, Maryland, Delaware, Illinois, and Mississippi, form the basis for the derivation of empirical flood frequency equations for small urban watersheds. These equations relate the flood discharge for recurrence intervals of 2.33 yr, 5 yr, 10 yr, 20 yr, and 50 yr to physiographic, urban, and climatic factors. The significant urban factors are the impervious cover and a channel urbanization factor. (Knapp-USGS)
W74-05738

FORM AND FLUVIAL PROCESSES IN ALLUVIAL STREAM CHANNELS,
Purdue Univ., Lafayette, Ind.
E. A. Keller.
Available from National Technical Information Service as PB-230 242, $10.00 in paper copy, $1.45 in microfiche. Ph.D. Thesis 1973, 124 p, 55 fig, 2 tab, 67 ref. OWRR-A-022-IND(3).

Descriptors: *Geomorphology, *Streambeds, *Meanders, *Channel morphology, *Channel beds, Stream bottoms, Rills, Alluvial channel, Channel width, Drainage density.
Identifiers: *Fluvial processes, Strahler stream order, Channel bed forms, Channel morphometry, Riffles, Pools, Bifurcation ratio.

The problem was to define quantitatively and qualitatively, for alluvial channels, selected aspects of form and fluvial processes which contribute to the development of fluvial systems. The relationship between the number of links and segments of natural drainage networks was found to be restricted to a narrow envelope. Theoretically, within this envelope a family of curves with the general form $y = 2x - (2n - 1)$ is defined, wherein y is the number of links, x is the number of segments, and n is the Strahler stream order defined for n = 2, 3, 4, 5. Comparison with more than 100 natural drainage networks indicated that these curves delineate threshold and boundary conditions and may be used to predict stream order. A five-stage model is proposed to explain the development of alluvial channels. The model is based upon channel morphology, channel morphometry, and qualitative conclusion based on numerous field observations. A generic classification is suggested, which permits hierarchical ranking of common bed forms in straight, sinuous, and meandering alluvial channels. Two major subdivisions: channel-forming and channel-altering bed forms are proposed.
W74-05819

SPECTRAL ANALYSIS AND ITS APPLICATION TO HYDROLOGIC TIME SERIES OF LOWER OHIO TRIBUTARIES,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 2A.
W74-05820

BUBBLY TWO-PHASE FLOW IN HYDRAULIC JUMP,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W74-05831

MODELS OF SPRING RUNOFF FORMATION AND PROBLEMS IN THEIR USE FOR FORECASTING THE FLOOD HYDROGRAPH,
Gidrometerologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2A.
W74-05842

NORFOLK HARBOR DISPOSAL STUDY: HYDROGEOLOGIC STUDY OF NANSEMOND CITY DISPOSAL AREA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 5B.
W74-05847

FLOOD PROFILES AND INUNDATED AREAS ALONG THE LOWER NISQUALLY RIVER, WASHINGTON,
Geological Survey, Tacoma, Wash.
J. E. Cummans.
Water-Resources Investigations 42-73, 1974. 9 p, 2 fig.

Descriptors: *Floods, *Washington, *Flood profiles, Flood recurrence interval, Flood data, Flood discharge, Flood stages.
Identifiers: *Nisqually River(Wash).

Flood profiles covering the reach from near the river mouth to river mile 6.4 were developed in a 2-year field study (1970-72) of the Nisqually River, Washington. The main channel of the reach will convey without overflow discharges as large as about 21,000 cfs, which have a 6-year recurrence interval. The banks in some areas will be overtopped at a flow of 25,500 cfs, which has a 13-year recurrence interval. The areas where overbank flooding will first occur and water-surface profiles of a 3.4-year and 100-year flood were determined for six flood-profile stations. The largest flood for which data are available was that of December 1933; the approximate area that would be presently inundated by such a flood is shown. Alder and La Grand Reservoirs can reduce the magnitude of lower annual flood peaks downstream to some extent. (Knapp-USGS)
W74-05849

THE ESTIMATION OF FLOOD FLOWS FROM NATURAL CATCHMENTS,
Transport and Road Research Lab., Crowthorne (England).
For primary bibliographic entry see Field 4A.
W74-05850

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR DEEP CREEK, COLORADO RIVER BASIN, TEXAS, 1971,
Geological Survey, Austin, Tex.
J. N. Lee.
Open-file report (Texas District), July 1973. 76 p, 2 fig, 3 tab.

Descriptors: *Hydrologic data, *Data collections, *Texas, *Rainfall-runoff relationships, *Stream gages, Streamflow, Reservoirs, Flood control.
Identifiers: *Colorado River basin(Tex).

The U.S. Soil Conservation Service is actively engaged in the installation of flood- and soil-erosion reducing measures in Texas. Hydrologic investigations of these small watersheds were begun by the Geological Survey in 1951 and are now being made in 12 areas. This report is concerned with the watershed above the Geological Survey stream-gaging stations on Deep Creek in the Colorado River basin. Six floodwater-retarding structures have been completed in the watershed. They have a combined total capacity of 5,660 acre-feet and regulate floodflow from 19.9 square miles (45%) of the drainage area above the stream-gaging station. Instruments to collect rainfall, runoff, and storage data in the Deep Creek study area consist of a network of rain gages, staff gages on four pools, continuous water-stage recorders on the other two pools, and recording stream-gaging stations. During the 1971 water year, the weighted-mean rainfall over the Deep Creek portion of the study area was 32.71 inches and over the Dry Prong Deep Creek portion of the study area it was 24.85 inches. The rainfall over the Deep Creek portion was 18% above the long-term average rainfall of 27.74 inches at Brownwood. For the 1971 water year, three storms were selected for detailed computation at each recording site. These computations include detailed time breakdown of rainfall and discharge. Hydrographs and mass curves are drawn for illustrations. The storms selected occurred July 26, 27, and August 1, 1971. A summary of rainfall-runoff data for the storms is shown. (Knapp-USGS)
W74-05851

LONG-DISTANCE TELEMETRY OF DATA FOR FLOOD FORECASTING,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 4A.
W74-05859

FLOOD HAZARD ANALYSES, SAND CREEK, CITY OF COLORADO SPRINGS, AND EL PASO COUNTY.
Soil Conservation Service, Portland, Oreg.
Prepared in cooperation with Colorado Water Conservation Board, July 1973. 18 p, 38 exhibit, 4 photo, 57 map, 1 tab.

Descriptors: *Floods, *Hazards, *Maps, *Colorado, Mapping, Surveys, Aerial photography.
Identifiers: *Colorado Springs(Colo).

Flood hazards near Sand Creek in the city of Colorado Springs, Colo., are shown by a map atlas of 57 sheets scaled about 1 inch = 200 ft. Data were collected by aerial photography. Flood areas were determined by matching water surface profiles with topography. Primary purpose is to provide maps of the flood hazard areas so that local governments can develop flood plain regulations. The data can also be used in the location and design of roads, bridges, and channel modification. Interpretations of the flood hazard analyses and recommendations to minimize flood damages are included. Except during the periods of storm runoff, the streambed of Sand Creek is dry. The flood-producing storms normally occur during the summer months from May through August. Runoff from melting snow does not contribute materially to flooding on Sand Creek. (Knapp-USGS)
W74-05860

NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM, FORECAST PROCEDURES.
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 4A.
W74-05861

WATER RESOURCES DATA FOR NEW YORK, 1972: PART 2. WATER QUALITY RECORDS.
Geological Survey, Albany, N.Y.
Data Report, 1973. 262 p, 9 fig, 2 tab, 20 ref.

Descriptors: *Water quality, *New York, *Hydrologic data, Data collections, Water chemistry, Microbiology, Water temperature, Sediments, Sediment load, Sampling.

Water resources data for the 1972 water year for New York include records of data for the chemical and physical characteristics of surface, ground, and precipitation water. Chemical, microbiological, water temperature, and fluvial-sediment water-quality information is presented. Chemical quality includes concentrations of individually dissolved constituents and certain properties or characteristics such as hardness of water, specific conductance, and pH. Microbiological information includes quantitative identification of certain bacteriological indicator organisms. Many surface-water samples for analyses are collected at or near gaging stations. The discharge records at these stations are used in conjunction with the computations of the chemical constituents and sediment loads. The description of the sampling station gives location, drainage area, periods of record for the various water-quality data, extremes of the pertinent data and general remarks. (Knapp-USGS)
W74-05931

2F. Groundwater

GROUND-WATER DATA FOR HARRIS COUNTY, TEXAS: VOLUME II--RECORDS OF WELLS, 1892-1972,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-05527

THE DETECTION OF SUBSURFACE STREAM CHANNELS IN CARBONATE ROCKS BY GEOELECTRICAL METHODS,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
R. K. Frohlich, and G. P. Smith.
Available from National Technical Information Service as PB-229 847 $6.75 in paper copy, $1.45 in

microfiche. Missouri Water Resources Center, Columbia, Completion Report, February 1974. 71 p, 24 fig, 5 tab, 12 ref, append. OWRR A-065-MO(1). 14-31-0001-3825.

Descriptors: Electrical studies, *Resistivity, *Gravity studies, Geophysics, *Channels, *Subsurface investigations, Carbonate rocks, Karst hydrology, *Missouri, Depth, Gravimetric analysis, *Groundwater movement.
Identifiers: Karst terranes.

The distinction of partially dissolved rocks from compact carbonate rocks and from the alluvial overburden is a major problem in geological engineering and water resources. Geoelectrical depth soundings after Schlumberger were applied over karst terranes in three locations of the Ozarks of Missouri. The zone of dissolved carbonate rocks shows intermediate resistivities between its low values of the overburden and its extremely high value for the compact rock. The investigation helped solve the problem of a disappearing river in Logan Creek Valley, near Ellington, Missouri. Combined geoelectrical and gravity surveys under consideration of some seismic near surface refractions indicate zones of increased depth and dissolution at the Ellington Fault. A detailed gravity profile across the fault shows a negative anomaly with a minimum of -2.0 mgal, which extends over approximately 3 miles with large lateral gradients. A theoretical model can explain the anomaly for a depth of the cavernous limestone of 350 feet with a bulk volume of fissures and stream channels amounting to 15%. The coincidence between the fault and the negative anomaly suggests that ruptures along several fault planes weakened the rock so that chemical dissolution from surface waters had a greater penetration.
W74-05541

AVAILABILITY OF GROUND WATER IN THE FEDERAL WAY AREA, KING COUNTY, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 4B.
W74-05545

A SUMMARY ON GROUND WATER IN THE HAN RIVER BASIN, REPUBLIC OF KOREA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W74-05546

THE WATER TABLE ON LONG ISLAND, NEW YORK, IN MARCH 1970,
Geological Survey, Mineola, N. Y.
For primary bibliographic entry see Field 4B.
W74-05556

EVOLUTION OF THE ISOTOPIC COMPOSITION OF LEAD IN ANCIENT MARINE BASINS (K VOPROSU OB EVOLYUTSII IZOTOPNOGO SOSTAVA SVINTSA V DREVNIKH MORSKIKH BASSEYNAKH),
Akademiya Nauk SSSR, Leningrad. Institut Geologii i Geokhronologii Dokembriya.
E. K. Gerling, and A. D. Iskanderova.
Geokhimiya, No 1, p 116-120, January 1973. 1 fig, 2 tab, 9 ref.

Descriptors: *Geochemistry, *Isotope studies, *Lead radioisotopes, *Lead, *Sedimentary basins(Geologic), Sediments, Uranium radioisotopes, Carbonate rocks, Dolomite, Limestones, Calcite, Pyrite, Sea water, Geologic time.
Identifiers: *USSR, Marble, Thorium.

To obtain data on evolution of the isotopic composition of lead in carbonate rocks of ancient seas, analyses were made of about 60 samples of limestones, dolomite, and marble of varying geologic age and derived from different regions of the USSR (Aldan, Ukraine, Pamirs, Urals, etc.). Lead in seawater undergoes the same changes in its isotopic composition with time as lead in the earth's crust and, hence, reflects the evolution of terrestrial lead. (Josefson-USGS)
W74-05559

GROUNDWATER RESOURCES OF CENTRAL ASIA (RESURSY GRUNTOVYKH VOD TSENTRAL'NOY AZII),
Akademiya Nauk SSSR, Moscow. Institut Geografii.
N. T. Kuznetsov.
Akademiya Nauk SSSR Izvestiya, Seriya Geograficheskaya, No 5, p 45-54, September-October 1973. 3 tab, 12 ref.

Descriptors: *Groundwater resources, *Groundwater availability, *Groundwater, *Surface-groundwater relationships, *Mountains, Water balance, Alluvium, Estimating.
Identifiers: *USSR(Central Asia).

Distinct differences are observed in the distribution of natural groundwater resources in individual mountain systems of Central Asia. In the Mongolian Altay, Tien Shan, Kunlun Shan, and Altyn Tagh, groundwater resources decrease from west to east. The opposite trend is observed in the Nan Shan and Hangayn-Henteyn mountains. Minimum natural groundwater resources are found in mountains of western Nan Shan, the eastern part of Altyn Tagh and on southeastern ridges of Tien Shan. Total natural groundwater resources in the mountains of Central Asia are estimated at 45.62 cu km/yr, of which more than half (26.6 cu km/yr) are concentrated in the Tien Shan and Kunlun Shan. Flooding of the northern piedmont plain of Kunlun Shan is due to the presence of thick alluvial fans of the Guma, Yurung Kash, Kara Kash, Keriya, and Niya Rivers where groundwater is abundant, comprising a large part of the natural groundwater resources of the region. Natural groundwater resources of the Tarim basin, estimated at 11.64 cu km/yr, are concentrated in thick alluvial fans of the Muz Art, Konchedar'ya, Aksu, Yarkand, Yurung Kash, Kara Kash, and several other less water-bearing rivers. Natural groundwater resources of lowlands in the Tarim basin are estimated at 8.67 cu km/yr, of which 1.09 cu km/yr is groundwater outflow from the Kashgar amphitheatre. Estimated natural groundwater resources of Tien Shan and Kunlun Shan, lowland areas of Kashgaria and Dzungaria, and of major intermontane depressions of Central Asia are tabulated. (Josefson-USGS)
W74-05562

GROUNDWATER OF PASTURES OF KAZAKHSTAN (PODZEMNYYE VODY PASTBISHCHNYKH TERRITORIY KAZAKHSTANA).
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Gidrogeologii i Gidrofiziki.
Izdatel'stvo 'Nauka' Kazakhskoy SSR, Alma-Ata, Akhmedsafin, U. M., editor, 1969. 304 p.

Descriptors: *Groundwater, *Confined water, *Groundwater resources, *Pastures, *Areal hydrogeology, Geomorphology, Stratigraphy, Rocks, Aquifers, Water table, Water levels, Water level fluctuations, Water wells, Water types, Thermal water, Connate water, Pore water, Water chemistry, Cross-sections, Mapping.
Identifiers: *USSR(Kazakhstan), Mineralization.

The area of pastures in Kazakhstan exceeds 180 million ha, which is 56% of all pastures in the USSR. Groundwater and artesian water of pastures in 15 Oblasts of the Republic and thermal water of pastures in 8 Oblasts of the Republic are described. Adaptation of different groundwater types to specific age and lithological complexes of rocks is examined, and studies are made of lithology and thickness of aquifers and of spatial distribution, depths of occurrence, mineralization, and chemical composition of groundwater and artesian water. Groundwater resources are determined for each large area of pasture, and prospects of their utilization are discussed. Recommendations are made for efficient use of groundwater and artesian water for agricultural water supply, flooding, and oasis irrigation. (Josefson-USGS)
W74-05563

A PROGRESS REPORT ON RESULTS OF TEST-DRILLING AND GROUND-WATER INVESTIGATIONS OF THE SNAKE PLAIN AQUIFER, SOUTHEASTERN IDAHO,
Geological Survey, Boise, Idaho.
E. G. Crosthwaite.
Available from Idaho Dept. of Water Admin., Statehouse-Annex 2, Boise, Idaho 83707 Price $0.50. Idaho Department of Water Administration Water Information Bulletin No 32, October 1973. 60 p, 11 fig, 1 tab, 11 ref.

Descriptors: *Hydrogeology, *Idaho, Aquifer characteristics, Stratigraphy, Basalts, Water table, Artesian aquifers, *Groundwater, Water wells, Data collections, Hydrologic data, *Aquifer testing.
Identifiers: *Snake Plain Aquifer(Idaho).

Test holes were drilled to depths of approximately 1,000 feet in the Mud Lake region of Idaho. A large part of the region is underlain by both sedimentary deposits and basalt flows. The saturated geologic section consists predominantly of beds of sediments that are intercolated with numerous basalt flows. Downgradient from the barrier, sedimentary deposits are not common and practically all the water-bearing formations are basalt. The sedimentary-basaltic sequence forms a complex hydrologic system in which water occurs under water-table conditions in the upper few tens of feet of saturated material and under artesian conditions in the deeper material in the southwest part of the region. Three wells were drilled and another well deepened in a part of the Snake River Plain where geologic and hydrologic data are sparse. Most of the material drilled was basalt with a few thin interbedded fine-grained sedimentary deposits. The sediments increase in thickness and coarseness near the mouth of the Big Lost River basin. The water-level data obtained from the wells indicate that the water-table gradient is relatively steep between Arco and American Falls and that the gradient is relatively low southwest of the area of steep gradient. The reason for the steep gradient is not clear, but the water table may be influenced by a rift zone which is visible more than three-fourths of the way across the Plain from the Craters of the Moon National Monument; by a change in thickness of the aquifer caused by a ridge representing a buried north-south treding mountain range; by a significant thickening of basalt filling an erosional basin immediately downgradient from the steepened gradient; or by a fault in the underlying basalt whose trace has been obliterated by younger flows. (Knapp-USGS)
W74-05715

LONGITUDINAL DISPERSION IN SATURATED POROUS MEDIA,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B.
W74-05832

GROUND WATER IN THE KANSAS RIVER VALLEY, JUNCTION CITY TO KANSAS CITY, KANSAS,
Geological Survey, Lawrence, Kans.
For primary bibliographic entry see Field 4B.
W74-05848

SINKHOLE PROBLEM ALONG PROPOSED ROUTE OF INTERSTATE HIGHWAY 459, NEAR GREENWOOD, ALABAMA,
Geological Survey, University, Ala.
J. G. Newton, C. W. Copeland, and L. W. Scarbrough.
Alabama Geological Survey, University Circular 83, 1973. 63 p, 21 fig, 2 plate, 3 tab, 18 ref.

Descriptors: *Land subsidence, *Karst hydrology, *Sinks, *Alabama, Withdrawal, Mine drainage, *Water table, Hydrogeology, Water level fluctuations, *Groundwater movement, Infiltration, Highways.
Identifiers: Greenwood(Ala).

Sinkholes in and adjacent to the proposed right-of-way of Interstate Highway 459 near the community of Greenwood in Bessemer, Alabama, pose costly construction and potential maintenance and safety problems. More than 150 sinkholes, depressions, and related features have formed in or near the right-of-way. Their occurrence began about 1950 and continued through March 1972. A general lowering of the water table during the early 1950's or the preceding decade, compounded with a prolonged drought during the 1950's, makes the area prone to the development of sinkholes. Openings along faults and a fold provide hydraulic connection between aquifers at the surface and mines at depths exceeding 1,000 feet. Cessation of pumpage from wells and mines has resulted in conditions favorable to the recovery of the water table. Sinkholes occur where cavities develop in residual or alluvial deposits overlying openings in limestone. The downward migration of the deposits into openings in the underlying limestone and the formation and collapse of the cavities are caused or accelerated by a decline in the water table that results in (a) an increase in the amplitude of water-table fluctuations, (b) the increased movement of surface water through unconsolidated deposits into openings in bedrock in areas where recharge had previously been rejected, (c) an increase in the velocity of movement of groundwater, and (d) loss of support to unconsolidated deposits overlying openings in bedrock. A recovery of the water table will probably result in a cessation of or drastic decrease in sinkhole development. (Knapp-USGS)
W74-05857

2G. Water In Soils

DETECTING SALINE SOILS IN THE RED RIVER VALLEY, MINNESOTA, BY REMOTE SENSING TECHNIQUES,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 7B.
W74-05519

METHODS OF MEASURING SOIL MOISTURE,
McMaster Univ., Hamilton (Ontario).
R. G. Wilson.
International Field Year for the Great Lakes Technical Manual Series No 1, 1971. 19 p, 4 fig, 4 plate, 1 tab, 88 ref.

Descriptors: *Soil moisture meters, *Instrumentation, *Measurement, Soil water movement, Soil water, Soil moisture, Nuclear moisture meters, Moisture content.

The techniques and the potential errors and accuracies of measuring soil moisture content, suction, and movement are reviewed. There are three widely used methods of measuring soil moisture content: the gravimetric, the neutron scattering, and the gamma-ray attenuation methods. The neutron scattering method is the most accurate for routine field measurements. The complex procedures required for the use of the gamma-ray attenuation method make it more suitable for laboratory work. The determination of the average moisture content in a volume of soil is best achieved by the neutron method, whereas the gamma-ray attenuation method is best suited for determining the moisture content at a given point in a soil profile. Soil suction can be measured with tensiometers, pressure and suction apparatus, psychrometers and electrical resistance units. Pressure and suction apparatus can be used only in a laboratory, and the accuracy of the technique is questionable. The use of tensiometer-pressure transducer systems has been limited to laboratories, but they have recently been developed for field use. They possess many advantages over the tensiometer-manometer systems including greater sensitivity and the possibility of recording. The main disadvantage of the tensiometer is that it is useful only over a limited range of suction values. Psychrometers and resistance blocks overcome this disadvantage but are not very accurate. Soil moisture movement is usually calculated from the hydraulic gradient and the hydraulic conductivity. Sensors to detect moisture movement have recently been developed but are strictly experimental at present. (Knapp-USGS)
W74-05557

MICROWAVE RADIATION CHARACTERISTICS OF DRY AND MOIST GROUND COVERS,
For primary bibliographic entry see Field 2C.
W74-05558

TENSIOMETER-PRESSURE TRANSDUCER SYSTEM FOR STUDYING UNSTEADY FLOW THROUGH SOILS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
D. W. Fitzsimmons, and N. C. Young.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 2, p 272-275, March-April, 1972. 6 fig, 10 ref.

Descriptors: *Soil moisture meters, *Tensiometers, *Soil water movement, Moisture tension, Pressure measuring instruments, Unsteady flow, Unsaturated flow, Soil water, Tension, Soil moisture, Irrigation, Measurement, *Non-destructive tests.

A new, fast-acting system has been developed to nondestructively measure moisture content of soil. The system is based on the old tensiometer technique with two important changes. A tensiometer barrier material made of polyvinyl chloride is used. This allows the water to pass to or from the soil much more quickly than previous materials. Diaphragm-type pressure transducers which have extremely small full-scale volumetric displacements provide much faster readings. These units were used to investigate moisture movement. Descriptions of technique and apparatus along with results are presented. (Skogerboe-Colorado State)
W74-05668

SUBSURFACE DISTRIBUTION OF NONUNIFORMLY APPLIED SURFACE WATERS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-05671

MEASUREMENT OF UNSATURATED HYDRAULIC CONDUCTIVITY BY THE CONSTANT OUTFLOW METHOD,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
A. R. Overman, and H. M. West.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 6, p 1110-1111, November-December, 1972. 6 fig, 4 ref.

Descriptors: *Drainage engineering, *Soil physical properties, *Soil water movement, Soil physics, Permability, Percolation, Soil moisture, Drainage, Drainage effects, Farm management, *Hydraulic conductivity, Measurement.

Unsaturated hydraulic conductivity was calculated for Lakeland fine sand using constant outflow from the bottom end of a column. Beginning at saturation, hydraulic head was measured at several positions during drawdown. Water content was found to drop from 34.6 percent at saturation to approximately 11 percent and a corresponding tension of 60 cm. Drainage appears to continue toward constant water content rather than toward the true equilibrium condition of constant hydraulic head. (Skogerboe-Colorado State)
W74-05675

WATER TABLE AND SOIL MOISTURE PROBABILITIES WITH TILE DRAINAGE,
Clemson Univ., S.C. Dept. of Agricultural Engineering.
T. C. Young, and J. T. Ligon.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 3, p 448-451, May-June, 1972. 8 fig, 13 ref.

Descriptors: *Subsurface drainage, *Tile drainage, Model studies, Mathematical models, Computer models, Drainage, Drainage engineering, Closed conduits, *South Carolina, *Water table, *Soil moisture, Climatic data.

A method of soil mosture balance proposed by Ligon et al. (1965) was modified to include surface runoff and checked against field data. The agreement of the measured and computed data indicated that the soil moisture balance was adequate for estimating soil moisture conditions and excess moisture. The transient-flow equation development by van Schilfgaarde (1965) was verified with five months field data from a field drainage laboratory. The excess moisture estimated from the soil moisture balance was considered as the net accretion to the water table. The soil moisture balance and the transient-flow equation were combined in a computer model of the environment, soil and drainage system. An average decrease of 1.67 percent of soil moisture in the upper 30 inches of soil was found for a one-foot drop of the water table. (Skogerboe-Colorado State)
W74-05677

ESTIMATION PROCEDURES FOR RESPONSE FUNCTIONS OF CROPS TO SOIL WATER CONTENT AND SALINITY,
Hebrew Univ., Jerusalem (Israel). Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W74-05678

SHAPE FACTORS IN IRRIGATION WATER ADVANCE EQUATION,
Uttar Pradesh Agricultural Univ., Naini Tal (India). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-05681

WATER-LEACHABLE NUTRIENTS FROM FROZEN OR DRIED PRAIRIE VEGETATION,
South Dakota State Univ., Brookings. Dept. of Plant Science.
For primary bibliographic entry see Field 5B.
W74-05696

SLOW MOVEMENT OF EARTH UNDER TROPICAL RAIN FOREST CONDITIONS,
Clark Univ., Worchester, Mass. Graduate School of Geography.
For primary bibliographic entry see Field 2J.
W74-05724

SITE EVALUATION ACCORDING TO SOIL MOISTURE CONTENT AND ECESSARY IMPROVEMENT PRACTICES IN THE USSR,
Main Geophysical Observatory, Leningrad (USSR).
Ye. N. Romanova.
Soviet Hydrology: Selected Papers, No 3, p 250-259, 1972. 4 fig, 1 tab, 7 ref. Translation of Transactions of the Voyeykov Main Geophysical Observatory (Trudy GGO), No 288, p 66-82, 1972.

Descriptors: *Soil moisture, *Moisture content, *Sites, *Slopes, *Soil management, Irrigation practices, Hydrologic budget, Water balance, Precipitation(Atmospheric), Evaporation, Variability, Seasonal, Mapping, Equations.
Identifiers: *USSR, Nomograms.

To estimate variations in soil moisture content as a function of site, relief features must be used to quantitatively determine uneven distribution of precipitation and its uneven loss through evaporation from slopes of different steepness and orientation. To determine moisture supply of soils at different locations by humidity zones, nomograms were constructed for loam soils on slopes with a straight and concave profile and with a convex profile. These nomograms can be used to estimate similar moisture conditions in different zones and possible soil moisture variations as a function of site in each zone. Improvement practices for a complex relief in different humidity zones are diagrammed for spring and summer, and 11 regions in the USSR are delineated on a map to show locations with optimum soil moisture conditions and areas with most unfavorable soil moisture conditions within humidity zones ranging from excessively wet to arid. (Josefson-USGS)
W74-05841

A MULTIPHASE MODEL FOR INFILTRATION (MODELE D' INFILTRATION POLYPHASIQUE),
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
Paper presented at French-English Symposium on Unsaturated Flow in Porous Media, Reading, England, January 24-25, 1973. 10 p, 5 fig, 4 ref, OWRR B-070 Colo(2).

Descriptors: *Infiltration, Model studies, Air environment, *Subsurface flow, *Unsaturated flow.
Identifiers: *Air flow, Air compressibility, *Imbibition, *Two-phase flow.

The traditional equations of water movement in the unsaturated zone neglect air movement. Under certain circumstances it is known that the viscous resistance to air flow and the air compressibility have significant effects on the water behavior. The goal is to show in a particular case, that the more rigorous approach of the two-phase flow theory does not complicate the solution of the problem. There is therefore no reason, theoretical or practical, not to treat the problem of water movement in the unsaturated zone in the more rigorous and, importantly, more physical manner.
W74-05911

THE ROLE OF SOIL WATER IN THE HYDROLOGIC BEHAVIOR OF UPLAND BASINS,
Georgia Univ., Athens. School of Forest Resources.
W. L. Nutter.
In: Field Soil Water Regime, Soil Science Society of America, Madison, Wisconsin, Special Publication No. 5, Chapter 10, p 181-193, 1973, 6 fig, 19 ref. OWRR A-022-GA(2) and A-025-GA(1), 14-31-0001-3210 and 14-31-0001-3510.

Descriptors: *Soil water movement, Infiltration, Retention, *Subsurface flow, Subsurface drainage, Recession curves, Streamflow, *Base flow, Effluent streams, *Storm runoff, Regolith. Identifiers: Dynamic storage, Basin geometry, *Upland basins, *Stormflow source areas.

The distribution of soil water in upland basins greatly affects the extent of source areas and the response patterns of both storm and between-storm streamflow. Except during the most extreme storms, all the precipitation falling on well-vegetated slopes infiltrates and while some reappears in the channel as stormflow, a major portion of the rain remains in the basin as dynamic storage. During a storm, the stormflow source area expands out from the stream channel as slopes contribute primarily unsaturated subsurface flow and the channel system lengthens. After the storm ceases, source areas may continue to expand as subsurface flow feeds the lower slopes near the channel, often leading to a second hydrograph peak several hours or days after the rain ceases. As the channel system and source areas recede, unsaturated subsurface flow continues to sustain baseflow. Basin parameters that affect the soil water regime and associated soil water energy conditions, and therefore the distribution of source areas, are slope length from channel to ridge, angle of slope, regolith depth, and regolith physical properties. Physical models of hillslope segments have provided some insight into the interrelations among the basin parameters as well as the flow pathways and source areas of subsurface flow.
W74-05913

LATERITIC DEEP WEATHERING OF GRANITE,
Western Australia Univ., Nedlands. Dept. of Soil Science and Plant Nutrition.
R. J. Gilkes, G. Scholz, and G. M. Dimmock.
Journal of Soil Science, Vol 24, No 4, p 523-536, December 1973. 5 fig, 2 tab, 24 ref.

Descriptors: *Weathering, *Granites, *Laterites, *Australia, Soil formation, Geochemistry, Soil chemistry, Mineralogy, Calcium, Sodium, Magnesium, Kaolinite, Trace elements, Iron, Aluminum.

Chemical and mineralogical analyses of two representative laterite profiles developed from granite in southwestern Australia show several depth zones defined by particular mineral suites and geochemistry. Changes in geochemistry in both profiles can be related to the stability of the major mineral species and to the common isomorphous substitutions occurring in them. Ca, Na, and Mg, which are mainly present in plagioclase feldspars and ferromagnesian minerals, are removed during the earliest stage of alteration of the parent granite. K, Mn, Zn, and residual Ca, Na, Mg, and Sr decrease as microcline and micas alter to kaolin. Al and Fe are most abundant in the surface zones which contain secondary sesquioxide minerals. (Knapp-USGS)
W74-05929

GAMMA RADIATION FOR MEASURING WATER CONTENTS IN SOIL COLUMNS WITH CHANGING BULK DENSITY,
Royal Veterinary and Agricultural Coll., Copenhagen (Denmark). Hydrotechnical Lab.
S. E. Olesen.
Journal of Soil Science, Vol 24, No 4, p 461-469, December 1973. 4 fig, 8 ref.

Descriptors: *Nuclear moisture meters, *Gamma rays, Calibrations, Equations, Bulk density, Sorption, Expansive soils, Clays, *Loam, Soil types.

Water profiles in soil columns were measured by the single-source gamma radiation method, using the normal attentuation equation, as well as linear and parabolic equations for the relation between bulk density and volumetric water content. To compensate for moderate changes in the bulk density during the experiment both initial and final bulk density and the water content were used in the water profile estimations. For a sandy loam soil, the radiation method without any corrections for bulk density changes resulted in a mean error of the volumetric water content estimation of 0.035 when the water content changed from 0.35 to 0.15. By correction for changing bulk density by means of a linear or a parabolic equation the maximum difference between real and estimated water content was 0.009 and 0.002, respectively. Applying the parabolic method, the error of a single water content measurement was 0.004. (Knapp-USGS)
W74-05930

SOIL MOISTURE UNDER FOREST, BUKIT TIMAH NATURE RESERVE, SINGAPORE,
Singapore Univ.
R. D. Hill.
Gard Bull (Singapore). Vol 26, No 1, p 85-93. 1972. Illus.
Identifiers: Forests, *Nature reserves, *Soil moisture, *Malaya(Singapore).

The results of a study of moisture of 3 forested hill-slope soils are presented and compared with the results of a similar study in Malaya. Soil moisture levels were usually higher than under other forms of vegetation. Statistical analysis indicated that change of moisture content was consistent within each soil but less consistent between soils. A series of statistical experiments suggested that except for the A soil horizon, soil moisture (as determined by drying) correlated reasonably well with number of rain days and that the introduction of the factor e (evapotranspiration) resulted only in slightly improved correlations except for the A soil horizon where the use of e gave much better correlations.--Copyright 1973, Biological Abstracts, Inc.
W74-05947

SOIL CHARACTERISTICS IN THE SHALLOW AQUATORIA, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Hidrobiologii.
I. K. Palamarchuk.
Gidrobiol Zh. Vol 8, No 6, p 113-118. 1972.
Identifiers: *Aquatoria, Beckmannia-cruciformis, Butomus-umbellatus, Phragmites-communis, Shallow water, *Soils, Stratiotes-aloides, *Reviews.

A literature survey is presented of soil characteristics in shallow water aquatoria. Their composition and adaptability of some plants such as Bechmannia cruciformis (L.) Host., Phragmites communis Trin., Butomus umbellatus L., Stratiotes aloides L. are noted.--Copyright 1973, Biological Abstracts, Inc.
W74-05948

CHANGES OF SOIL HUMIDITY AND ITS CORRELATION TO PHYTOMASS PRODUCTION IN SANDY MEADOW ASSOCIATIONS,
Eotvos Lorand Univ., Budapest (Hungary). Dept. of Plant Taxonomy and Ecology.
E. Kovacs-Lang, and M. Szabo.
Ann Univ Sci Budap Rolando Eotvos Nominatae Sect Biol. 13, p 115-126. 1971. Illus.
Identifiers: Bromus-tectorum, Festuca-vaginata, Festuca-wagneri, *Phytomass production, Rye, Sandy meadows, *Soil humidity, *Danube River, *Tisza River.

In prairie associations characteristic of the sandy area between the rivers Danube and Tisza the phytomass production of overground and underground parts and its relation to precipitation and soil humidity were examined in 1 yr old (Brometum tectorum) and perennial meadows (Festucetum vaginatae danubiale and Festucetum wagneri) as well as in a rye field. In the vegetation periods of the years 1968 to 1969 soil humidity was regularly measured every mo. at 20, 40, 60, 100, 140 and 200 cm depth by means of a neutron scattering moisture meter. A predominance of un-

derground phytomass was characteristic of these natural associations. The production maximum of the 1 yr old meadow was observed in spring, followed by a gradual decay of organic substances in summer. The perennial meadows have a production maximum at the beginning of summer and another during the rainy autumn season. Soil humidity is influenced in the deeper layers by the quantity and in the upper layers by the distribution of rainfall. The prairies examined have an independent production rhythm, slightly influenced but not changed by humidity.--Copyright 1973, Biological Abstracts, Inc.
W74-05949

2H. Lakes

BACTERIAL DYNAMICS IN TWO HIGH-ARCTIC LAKES,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-05458

RESERVOIR STORAGE AND THE THERMAL REGIME OF RIVERS, WITH SPECIAL REFERENCE TO THE RIVER LUNE, YORKSHIRE,
Durham Univ. (England).
For primary bibliographic entry see Field 4A.
W74-05464

NITROGEN TRANSFORMATIONS IN SEDIMENTS AS AFFECTED BY CHEMICAL AMENDMENTS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-05485

EFFECTS OF SEDIMENTATION OF THE ALGAL FLORA OF A SMALL RECREATIONAL IMPOUNDMENT,
Virginia Commonwealth Univ., Richmond. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-05486

METHANE FORMATION BY LAKE SEDIMENTS DURING IN VITRO INCUBATION,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-05487

TREND SULFACE ANALYSIS AND SEASONAL DISTRIBUTION PATTERNS OF PRIMARY NUTRIENTS AND CHLOROPHYLL IN UNSTRATIFIED GULF COAST ESTUARIES,
Texas Univ., Houston. School of Public Health.
For primary bibliographic entry see Field 5B.
W74-05488

SPECIES INTRODUCTION IN A TROPICAL LAKE,
Washington Univ., Seattle. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-05492

EXPERIMENTAL APPROACHES TO LIMNOLOGY - AN OVERVIEW,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W74-05498

ECOLOGY OF FLOODPLAIN POOLS IN THE KASKASKIA RIVER BASIN OF ILLINOIS,
Illinois State Natural History Survey, Urbana.
R. Weldon Larimore, Edward C. Doyle, and A. R. Brigham.
Available from the National Technical Information Service as PB-229 849; $10.50 in paper copy, $1.45 in microfiche. Illinois University Water Resources Center, Urbana, Research Report No. 75, December, 1973. 136 p, 26 fig, 32 tab, 11 ref, 1 append. OWRR B-025-ILL(2). 14-31-0001-1897.

Descriptors: *Biological communities, Water chemistry, Periphyton, Plankton, Benthos, Fish management, *Illinois, Flood plains, Ecology, *Fish reproduction, Aquatic plants, *Nutrients, Invertebrates, Fish populations.
Identifiers: Plant nutrients, *Kaskackia River basin(Ill.), *Floodplain pools.

Physical and chemical conditions and biological communities in seven different types of floodplain pools in the upper basin of the Kaskaskia River were intensely studied over a period of 18 months and related to similar observations in the adjacent Kaskaskia River. The greatest influence on physico-chemical parameters, periphyton, benthos, and fish in the pools was the presence or absence of aquatic vegetation, particularly surface mats that restricted light penetration. The pools had less periphyton and more zooplankton than the river. Occasional flushing by the floodwaters reduced the accumulation of detritus and promoted biological production. Many species of fish moved into the floodplain pools to spawn and the young produced took advantage of the generally abundant zooplankton. The value of fish production from these pools depends to a considerable extent on the seasonal water regime. Floodplain pools are important to the Kaskaskia River system and should be preserved and managed to maintain their high production.
W74-05536

THE MODIFICATION OF GREAT LAKES WINTER STORMS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
For primary bibliographic entry see Field 3B.
W74-05732

SUPERIOR-MICHIGAN-HURON-ERIE-ONTARIO: IS IT TOO LATE,
For primary bibliographic entry see Field 5G.
W74-05801

DECAY OF MASS OSCILLATIONS IN RECTANGULAR BASINS,
Worcester Polytechnic Inst., Mass. Alden Research Labs.
For primary bibliographic entry see Field 8B.
W74-05830

DISTRIBUTION AND MIXING OF INFLOW INTO STRATIFIED LAKES: A HYDRAULIC MODEL STUDY,
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
S. J. Vogel.
Paper presented at the Fourth Southwestern Graduate Research Conference in Applied Mechanics, New Mexico State University, March 23-24, 1973; 6 p, 1 fig, 5 ref. OWRR A-044-OKLA(1) 14-31-0001-3836.

Descriptors: *Dispersion, Lakes, *Mixing, *Stratification, Model studies, *Hydraulic models, *Inflow.
Identifiers: Vertical scale distortion.

The facility for the observation of inflows into models of stratified lakes is described and the modeling parameters, including vertical scale distortion, are discussed. (Moretti-Oklahoma)
W74-05917

MAJOR ELEMENT GEOCHEMISTRY O LAKE POWELL,
Dartmouth Coll., Hanover, N.H. Dept. of Eart Sciences.
R. C. Reynolds, and N. M. Johnson.
American Association for the Advancement c Science, 140th Paper presented at meeting, Sa Francisco, Feb. 1974. 22 p, 5 fig, 1 tab, 4 ref.

Descriptors: *Lakes, *Reservoirs, *Salinity *Water quality, Water properties, Artificial lake *Arizona, Utah, Stratification, Inflow, Lake sed ments, Limnology, Mixing, Thermal properties Turnovers, Upwelling, Saline water, Saline lake Chlorides, Calcium, Calcium carbonate, Bica bonates, Sulfates, Alkalinity.
Identifiers: *Lake Powell(Arizona).

Current and historical water quality data ar synthesized into an overall descriptive model c the chemical regime of Lake Powell. Sulfate, calc um, sodium, magnesium, chlorine, and alkalinit are analyzed, and concentration configurations ar determined. The salinity inputs from the Greer Colorado, and San Juan Rivers are analyzed a contributions of salts into the system of Lak Powell. The lake is a sulfate-bicarbonate-chlorid system with an approximate salinity of 550 ppr TDS. Monomictic convective and thermal regime are prevalent. Seasonal fluctuations in circulatio are documented. Calcium carbonate was found t precipitate from the input waters, with maximur precipitation probably occurring in the lowe reaches. This could account for a lowering o salinity of approximately 25 ppm. (Muller Arizona)
W74-05923

MODELING THE REGULATION OF LAKE SU PERIOR UNDER UNCERTAINTY OF FUTURI WATER SUPPLIES,
Sun Oil Co., Dallas, Tex.
For primary bibliographic entry see Field 4A.
W74-05938

2I. Water In Plants

CYPRETTA KAWATAI, A NEW SPECIES OI FRESHWATER OSTRACODA (CRUSTACEA),
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05454

THE MANGROVE IN NEW ZEALAND,
Kansas Univ., Lawrence. Dept. of Geography.
A. W. Kuchler.
N Z Geogr. Vol 28, No 2, p 113-129. 1972. Illus.
Identifiers: *Avicennia-resinifera, *Mangrove *New Zealand(North Island), Pastures, Species.

The mangrove vegetation in New Zealand from the far north to its southern limits in the center of North Island is described. There are relatively few strata and the floristic composition is always simple. A list is given of the main species (representing 6 communities) associated with the New Zealand mangrove (Avicennia resinifera). The seral status of the mangrove vegetation is emphasized. They can be reclaimed and converted to good pasture. They are not otherwise of economic importance in New Zealand.--Copyright 1973, Biological Abstracts, Inc.
W74-05469

APPLICATIONS OF AERIAL PHOTOGRAPHY AND ERTS DATA TO AGRICULTURAL, FOREST AND WATER RESOURCES MANAGEMENT.
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 7B.
W74-05515

FOREST DISEASE DETECTION AND CONTROL,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 7B.
W74-05516

THE OCCURRENCE AND DISTRIBUTION OF THE HYDROIDS OF THE GALVESTON BAY, TEXAS, AREA,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W74-05529

BIOLOGICAL STUDIES ON THE FRESHWATER SHRIMPS IN KOREA: 4. THE ECOLOGY OF MACROBRACHIUM NIPPONENSIS (DE HAAN) (IN KOREAN),
Texas A and M Univ., College Station. Dept. of Oceanography.
K. S. Chung.
Bull Kor Fish Soc. Vol 5, No 3, p 83-87. 1972, Illus. (English summary).
Identifiers: Biological studies, Ecology, Fishery, Food, *Korea, Macrobrachium-Nipponensis, *Protein(Fish), Sex ratio(Fish), *Shrimps, Spawning.

The fresh-water shrimp, M. nipponensis is one of the largest of the shrimp species and one of the most important types of protein food in fresh-water fisheries. It can be found from Cheju Island in the South to Chung-ju in river or swamp, in the North (Korea). Ecological features widely found in their natural environment were studied. Shrimps were collected from the Nak Dong River, near Pusan, Korea, once a month, from March-Dec. 1963. Larvae hatch from May-Sept., mainly in the month of July. The average sex ratio (male/female x 100) is 62.9% and goes down during the spawning season and rises from fall to spring season. The minimum size of the female with eggs is approximately 4.2 cm in body length, 3.5 g in body weight, and 1.5 cm in carapace length. Most shrimps of 5.75-7.75 cm in body length lay eggs. The dorsal spines of the rostrum are 10-16 (mode 13) in number and the ventral spines of the rostrum are 1-5 (mode 3) in number. (See also W73-13799)--Copyright 1973, Biological Abstracts, Inc.
W74-05583

EFFECT OF WATER-TABLE HEIGHT ON ROOT DEVELOPMENT OF PINUS CONTORTA ON DEEP PEAT IN SCOTLAND,
Macaulay Inst. for Soil Research, Aberdeen (Scotland).
R. Boggie.
Oikos, Vol 23, No 3, p 304-312, 1972, Illus.
Identifiers: Moisture, Morphology, *Peat, Pinus-contorta, *Root development, *Scotland, *Water table, *Pine trees.

Pinus contorta Dougl. was grown on deep peat in plots in which the water tables were maintained artificially at 5 levels 0-34 cm below the ground surface. Root growth was severely restricted under conditions of waterlogging, but a progressive improvement was seen as the level of the water table was lowered. Root morphology varied according to water treatment but in all profiles, root development was largely confined to the upper, aerobic horizons of the profiles as defined by absence of sulfide staining on Ag rods and redox potential measurements. There was a higher air/moisture volume ratio in the upper horizons of the peat in those parts of the plots planted with trees than in those under the natural vegetation.--Copyright 1973, Biological Abstracts, Inc.
W74-05617

A SURVEY OF STOMATAL MOVEMENTS AND ASSOCIATED POTASSIUM FLUXES IN THE PLANT KINGDOM,
Southern Piedmont Conservation Research Center, Watkinsville, Ga.
C. M. Willmer, and J. E. Pallas, Jr.
Can J Bot. Vol 51, No 1, p 37-42. 1973. Illus.
Identifiers: Arachis-Hypogaea, Commelina-Communis, Glycine-Max, Kalanchoe-Pinnata, *Potassium, *Stomatal movement, Surveys, *Epidemal tissue(Plants).

Histochemical tests for K+ were carried out on the epidermis of aerial organs from plants which varied in evolutionary development (e.g., club-mosses, ferns, angiosperms) and general morphology (e.g., monocotyledons, succulent dicotyledons, woody dicotyledons). These tests made on epidermal tissue with open or closed stomata suggested that K+ transport is implicated in stomatal movements regardless of the evolutionary level and the stomatal location in the plants investigated. In all species that displayed substantial stomatal opening, K+ was detectable in the guard cells. With small stomatal apertures, K+ was located in guard and subsidiary cells of Commelina communis L. leaves and Glycine max L. cotyledons. When stomata were closed, K+ was detectable in the subsidiary cells of the grass species, Kalanchoe pinnata Pers., C. communis, and, occasionally, in the epidermal cells surrounding the stomata of some ferns. A condition was also observed when virtually no K+ was detectable in the guard or subsidiary cells of C. communis leaves or G. max cotyledons. Commonly, when stomata were closed, K+ was not detectable in any cells of the epidermis. Exceptions were the 'K+ storage cells,' trichomes and epidermal cells of Arachis hypogaea L., and in the more primitive plants.--Copyright 1973, Biological Abstracts, Inc.
W74-05769

PERMEATION OF UNCHARGED ORGANIC MOLECULES AND WATER THROUGH TOMATO ROOTS,
Department of Agriculture, South Perth (Australia).
For primary bibliographic entry see Field 3F.
W74-05852

FOOD OF LARVAL SEA LAMPREY (PETROMYZON MARINUS) AND AMERICAN BROOK LAMPREY (LAMPETRA LAMOTTEI),
Guelph Univ. (Ontario). Dept. of Zoology.
J. W. Moore, and F. W. H. Beamish.
J Fish Res Board Can. Vol 30, No 1, p 7-15. 1973, Illus.
Identifiers: Achnanthes, *Algae, Amphora, Cyclotella, *Diatoms, Lampetra-Lamottei, Larval stages, Petromyzon-Marinus, *Sea lamprey, *Brook lamprey, *Anadromous fish, Fish diets.

Throughout the year, algae were the most frequently encountered organisms in the gut of larvae of landlocked and anadromous P. marinus and American L. lamottei. Relative abundance of organisms in the gut of both species was similar and did not change with length of larvae. In general, relative abundance of organisms in the gut was similar to that in samples of sediment and water. Occasionally, filamentous and episammic forms were not ingested because of their larger size. The number of algal cells ingested per unit of weight of sea lamprey decreased inversely with size of larvae. In the summer the number of algal cells in the gut was about thrice that found in the winter for larvae of comparable size. Survival among diatoms evacuated from the digestive tract varied from 45% in July (17.8 C) to 90% in Jan. (0 C). Representatives of the Achnanthes had the lowest survival rate (10-20%), while those of Amphora and Cyclotella had the highest (65-100%). Complete evacuation required approximately 54 and 70 hr at 16.0 and 2.5 C, respectively. Evacuation rate did not differ among the organisms consumed. The numbers of algae consumed by larval sea lamprey in a stream relative to their estimated abundance was considered negligible.--Copyright 1973, Biological Abstracts, Inc.
W74-05915

TECHNOLOGICAL MODIFICATION OF THE SEEDLING METHOD AND ANALYSIS OF ITS USEFULNESS FOR EVALUATION OF SALT TOLERANCE IN PLANTS,
For primary bibliographic entry see Field 3C.
W74-05920

DIFFERENTIAL TOLERANCE OF SOME ARID-RANGE WHEATGRASSES TO SNOW MOLD,
Agricultural Research Service, Logan, Utah.
A. T. Bleak, and W. Keller.
Journal of Range Management, Vol 26, No 6, p 434-435, November 1973. 2 tab, 7 ref.

Descriptors: Resistance, *Fungi, *Wheatgrasses, *Molds, *Range grasses, Snow, Snow cores, Snowmelt, Mortality, *Utah.
Identifiers: *Snow mold, Replicated plot.

Tolerance of four wheatgrass species to snow mold caused primarily by the typhus fungi was determined. A replicated plot containing 30 accessions of wheatgrass was used. On the basis of the percent of 1 year old plants killed, fairway wheatgrass was the most susceptible, followed by crested wheatgrass, Siberian wheatgrass, and intermediate wheatgrass which exhibited no mortality and only moderate injury. This study was a result of an infestation of snow mold in the spring of 1971 on an experimental plot near Logan, Utah. (Mastic-Arizona)
W74-05927

ECOLOGICAL AND PHYSIOLOGICAL PRINCIPLES OF PROTECTIVE AFFORESTATION IN SEMIDESERTS, (IN RUSSIAN),
For primary bibliographic entry see Field 4A.
W74-05945

LARCH PLANTATIONS IN THE FOREST STEPPE ZONE, (IN RUSSIAN),
For primary bibliographic entry see Field 4A.
W74-05946

CHANGES OF SOIL HUMIDITY AND ITS CORRELATION TO PHYTOMASS PRODUCTION IN SANDY MEADOW ASSOCIATIONS,
Eotvos Lorand Univ., Budapest (Hungary). Dept. of Plant Taxonomy and Ecology.
For primary bibliographic entry see Field 2G.
W74-05949

2J. Erosion and Sedimentation

METAMORPHOSIS OF A RIVER--A COMPARISON OF THE MISSISSIPPI RIVER BEFORE AND AFTER CUTOFFS,
Army Engineer District, Vicksburg, Miss. Potamology Section.
For primary bibliographic entry see Field 2E.
W74-05414

CELLULAR-BLOCK-LINED GRADE CONTROL STRUCTURE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W74-05523

HYDROMORPHOLOGY OF ALLUVIAL CHANNELS OF LOWLAND RIVERS AND TIDAL ESTUARIES,
Nanking Hydrotechnical Scientific Research Inst. (Chinese People's Republic).
K-J. Tou.

Available from NTIS, Springfield, Va 22151 AD-767 029 Price $3.00 printed copy; $1.45 microfiche. Naval Oceanographic Office Translation Report No 535, 1973. 23 p, 4 fig, 2 tab, 22 ref. (Translated from Scientia Sinica, Vol 14, No 8, p 1212-1227, 1965.)

Descriptors: *Alluvial channels, *Channel morphology, Discharge(Water), Particle size, Sediment transport, Bank stability, Stream erosion, Estuaries.
Identifiers: *China.

Theoretical studies of the morphology of the channels of streams and tidal estuaries are verified by measurements of water flow rates, channel width and depth, sediment size and transport (bedload and in suspension), and the mobility and stability of stream banks and bed in the principal streams of China and some in the USSR. Equations are derived relating these parameters to each other and to the cross-sectional and longitudinal profiles of channels. Channels of streams and tidal estuaries are compared. The effects of cyclical fluctuations in flood and tidal flows are discussed. An equation for the index of channel mobility describes the shape of both rivers and tidal estuaries. (Knapp-USGS)
W74-05547

DISCHARGE PATTERNS IN TWO CREVASSES OF THE MISSISSIPPI RIVER DELTA,
Wisconsin State Univ., Oshkosh. Dept. of Geography.
For primary bibliographic entry see Field 2L.
W74-05548

DROWNED AND BURIED VALLEYS ON THE SOUTHERN NEW ENGLAND CONTINENTAL SHELF,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
R. L. McMaster, and A. Ashraf.
Marine Geology, Vol 15, No 4, p 249-268, November 1973. 8 fig, 1 tab, 27 ref. ONR N00014-68-A-0215-003.

Descriptors: *Submarine canyons, *Valleys, *Atlantic Coastal Plain, Bathymetry, Sounding, Geomorphology, Pleistocene epoch, *Continental shelf, Marine geology, *New England.
Identifiers: Drowned valleys, New England continental shelf.

Seven post-Jurassic drowned or buried drainage systems were found on the southern New England shelf. The basement and younger stream patterns have a dominant southward trend. Fluvial action under stable tectonic conditions is suggested by low valley height/width ratios. Fluvial processes responding to sea-level withdrawals have greatly influenced the shelf's later development. Periodically during post-Paleocene time, sediment from subaerial erosion has been transported to the shelf edge by streams. Deltaic deposition on a subsiding base has controlled outbuilding on the outer shelf. The frequent presence of overlying drainage networks is the result of numerous sea-level regressions. Since Eocene time, sediment has been channelled to the deep sea via Block Canyon and its progenitor. Locally structures created by erosion and glacial deposition have governed drainage direction. On the inner shelf, late Tertiary - early Pleistocene streams were diverted southeastward and southwestward by Long Island's Coastal Plain escarpment and by secondary cuestas between eastern Long Island and Block Island. (Knapp-USGS)
W74-05549

RIDGE AND SWALE TOPOGRAPHY OF THE MIDDLE ATLANTIC BIGHT, NORTH AMERICA: SECULAR RESPONSE TO THE HOLOCENE HYDRAULIC REGIME,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
D. J. P. Swift, D. B. Duane, and T. F. McKinney.
Marine Geology, Vol 15, No 4, p 227-247, November 1973. 15 fig, 34 ref. USACE Contract DACW79-69-C-0016; NSF Grants GA-1381 and GA-27305.

Descriptors: *Sedimentary structures, *Bottom sediments, *Continental shelf, Sand waves, Topography, Sand bars, Sands, Currents(Water), Storms, Ocean currents, Atlantic Coastal Plain, Barriers, Barrier islands, Marine geology, Erosion, Sedimentation.
Identifiers: Middle Atlantic Bight.

The ridge and swale topography of the Middle Atlantic Bight consists of longitudinal bed forms. This topography is the response to a regime of intermittent, south-trending storm currents. Ridges may be initiated on the shore face and detached as the coast retreats to form fields of isolated ridges, or they may be molded into the shelf-transverse sand massifs that mark the retreat paths of littoral-drift depositional centers at estuary mouths and off cuspate forelands. The ridge and swale topography is thus a stable end configuration toward which a variety of nearshore constructional topographies have converged during the Holocene transgression. Morphologic evidence for readjustment of ridge topography to the deepening shelf flow field during the Holocene transgression is discernible. (Knapp-USGS)
W74-05550

AN ADDITIONAL LOCATION OF METALLIFEROUS SEDIMENTS IN THE RED SEA,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
R. D. Bignell, J. S. Tooms, D. S. Cronan, and A. Horowitz.
Nature, Vol 248, No 5444, p 127-128, March 8, 1974. 1 fig, 1 tab, 9 ref.

Descriptors: *Brines, *Sea water, *Trace elements, Heavy metals, Hydrothermal studies, Hot springs, Bottom sediments, Manganese, Mercury, Oceanography.
Identifiers: *Red Sea.

Nereus Deep, in the Red Sea, has brines and metalliferous sediments of distinctive composition. Nereus Deep is situated within the NW-SE trending median valley of the Red Sea, is 40 km long by 12 km wide, and is divided along its length by a saddle into two parallel basins. Each basin contains a number of distinct depressions which either contain brine pools or show evidence of having contained them in the past. An appreciable thickness of iron and manganese-rich sediment contains various minor elements. Sulphide layers rich in zinc, copper, and lead may occur at greater depths. Large concentrations of mercury in the deep support this view and may indicate hydrothermal enrichments of less volatile elements below. (Knapp-USGS)
W74-05554

TRANSPORT OF SOIL PARTICLES BY SHALLOW FLOW,
Agricultural Research Service, Lafayette, Ind.
G. R. Foster, and L. D. Meyer.
Transactions of ASAE (American Society of Agricultural Engineers), Vol 15, No 1, p 99-102, January-February, 1972. 3 fig, 2 tab, 15 ref.

Descriptors: *Erosion, *Soil erosion, *Rill erosion, *Sheet erosion, Sedimentation, Erosion rates, Sediment yield, Sediment load, *Sediment transport, Soil conservation.

The Yalin equation was selected to describe th sediment transport capacity of overland flow fo use in mathematical soil erosion models. Hydrau lic variables in the equation are simply the hydrau lic radius and slope steepness. Soil parameter needed are particle diameter, specific gravity, an the critical tractive force from Shields' diagram When modified to consider mixtures of partic sizes, the equation predicted both the total tran port rate and also the particle size distribution o the transported material. When rilling developed transport rate predictions were within a factor of relative to actual transport rates from a bed o glass spheres. Also, the predicted particle size di tributions often agreed well with observed di tributions. When applied to a field erosion pl where the sediment load was at transport capacity the equation predicted sediment load within a fac tor of 2. (Skogerboe-Colorado State)
W74-05669

COMPUTER ANALYSIS OF OBLIQU ACOUSTIC REFLECTION FOR OCEAN SED MENT IDENTIFICATION,
New Hampshire Univ., Durham. Dept. of Electri cal Engineering.
A. K. Newman.
Available from NTIS as COM 73-11907, $2.7 paper copy, $1.45 microfiche. Sea Grant Publica tion Report No. UNH-SG-110, July 1973. 10 p, fig, 7 ref. NOAA DC 1-36114.

Descriptors: *Acoustics, *Remote sensing *Sediments, *Numerical analysis, Computer Sediment-water interfaces, Particle size.
Identifiers: Greens' function.

IBM 360-50 digital computer subroutines wer prepared in Fortran IV (G-level) to compute th value of the integral as various parameters wer varied, to obtain the information and insigh needed for the optimum system design for remot acoustic sensing of the ocean sediments. Th preliminary investigations of the many possibili ties made available by this approach are reviewed For example, at 5000 Hz, the ratio of the 0 de (normal incidence) acoustic reflections fror coarse sand over those from fine sand is 1.085:1 At a geometric equivalent angle of incidence of 6 deg this ratio is improved to 1.328:1. Further im provements are possible if the system is designed to allow multi-frequency and multi-angle operation using advanced signal processing. Unforeseen capabilities have surfaced from computer-experi ments designed to test the limits of such improve ments. Two different sediments having identica acoustic impedances (acoustic impedance = Den sity x Compressional Wave Velocity), with one sediment having 1.1 greater wave velocity and 1/1.1 less density, have identical acoustical return energy at 0 deg or normal incidence, and were computed to have acoustic returns in a nearly 2:1 ratio at a geometric equivalent angle of incidence of 60 deg at 5000 Hz. Further computer analysis is presented showing increased improvement in remote differential sediment identification via im proved system design. (Sinha - OEIS)
W74-05697

THE STRUCTURE OF MANAGEMENT AND PLANNING FOR THE COASTAL ZONE,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W74-05702

LITTORAL DRIFT COMPUTATIONS ALONG THE COAST OF FLORIDA BY MEANS OF SHIP WAVE OBSERVATIONS,
Florida Univ., Gainesville. Coll. of Engineering.
T. L. Walton, Jr.
Available from NTIS as COM 73-11896 PC$5.25 microfiche $1.45. Coastal and Oceanographic Engineering Laboratory Technical Report No. 15, Sea Grant Publication, February 1973. 97 p, 165 fig, 7 tab, 3 append. NOAA SG NG-3-72.

escriptors: Florida, *Littoral drift, Refraction(Water waves), *Friction, Topography, Coasts.
dentifiers: Shoaling, Ship wave observations.

. large data source of ship wave observations is sed for the computation of littoral drift along segents of Florida's coast. Wave transformation om the observation site to a section of shore inludes effects of shoaling, refraction, friction, and ercolation. Assumptions are made that limit the nalysis to an ideal beach with no anomalies in ffshore topography. The results are presented in series of littoral drift roses which make it possile to find annual rates of littoral drift for sections f Florida having sandy shorelines. A comparison f computed values of drift with existing estimated alues is made for specific locations. Results of he comparison confirm most of the estimated rift directions, however the drift magnitudes iffer significantly. (Sinha-OEIS)
W74-05710

ATES OF QUATERNARY GLACIAL EROSION AND CORRIE FORMATION, MARIE BYRD AND, ANTARCTICA,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
J. T. Andrews, and W. E. LeMasurier.
Geology, Vol 1, No 2, p 75-80, October 1973. 6 fig, tab, 25 ref. NSF Grants GA-4563 and GA-21488.

Descriptors: *Erosion rates, *Erosion, *Glaciers, Antarctic, *Cirques, Melt water, Geomorphology, Frost action, Freezing, Thawing, Ice, Volanoes.
dentifiers: *Marie Byrd Land(Antarctica).

Three volcanoes composed of palagonite breccia n Marie Byrd Land, Antarctica have been extenively modified by glacial erosion and have numerous large cirques. Two of the volcanoes are adiometrically dated, which enables estimates to e made of the rate of erosion. Rates of denudaion of 360 to 460 mm per 1,000 yr were obtained, ut differences in corrie size indicate that local eadward erosion is about 5,800 mm per 1,000 yr nd lateral erosion is about 800 mm per 1,000 yr. The rate apply to relatively incompetent rock. Subaerial flows of comparable age in the same region are not as intensively eroded. Erosion is probably caused by mechanical riving induced by the freezng of meltwater, which is in turn produced by ocal radiation conditions in the corries. Thus, glacial erosion seems to depend upon the existence of edrock exposed above the ice sheet and the production of meltwater. (Knapp-USGS)
W74-05717

COMPOSITIONAL SORTING OF TOPOGRAPHICALLY HIGH TENNESSEE RIVER GRAVELS: A GLACIAL HYPOTHESIS,
Mississippi State Univ., State College. Dept. of Geology and Geography.
J. M. Kaye.
*Glaciation, *Tennessee River, *Glacial sediments, *Mississippi, Pleistocene epoch, Gravels, Sediment sorting, Provenance, Sediment transport.

Compositional sorting of topographically high river terrace gravels along the southwestern portion of the Tennessee River valley may be explained by alternate blanketing and uncovering of the source of metaquartzite by glacial ice in the Blue Ridge province of the southern Appalachians. Glacial meltwater may have caused the Tennessee River to spill over into the Black Belt of Mississippi where metaquartzite cobbles are found associated with a Rancholabrean vertebrate fauna. Heavy minerals associated with the metaquartzite cobbles are similar on both sides of the present Tennessee Valley Divide, adding support for a glacially controlled temporary spillover of the Tennessee River. (Knapp-USGS)
W74-05718

PROPOSAL FOR A PARTICLE-SIZE GRADE SCALE BASED ON 10,
Wisconsin Univ., Kenosha. Dept. of Geology.
J. H. Shea.
Geology, Vol 1, No 1, p 3-8, September 1973. 2 fig, 1 tab, 50 ref.

Descriptors: *Particle size, *Classification, Sampling, *Sedimentology, Sedimentation.
Identifiers: Particle-size scales.

Because the United States will eventually adopt the metric system, geologists should consider abandoning the nondecimal Udden-Wentworth-Krumbein (UWK) grade scale of particle sizes. Most of the advantages claimed for the UWK system also apply to other geometric grade scales that have an associated log-transform scale. A new grade scale is proposed. An associated log-transform scale (the tau scale) is defined so that tau = 12 log 10 d/do, where do is grain diameter in millimeters and do is 1 mm. The proposed scale has easily remembered grade limits and easily calculated log-transform scale, repeating numbers, major classes of equal interval, and good potential for international adoption and application in other fields. (Knapp-USGS)
W74-05719

LATE QUATERNARY SEDIMENTATION IN THE ACTIVE EASTERN ALEUTIAN TRENCH,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Geology.
D. J. W. Piper, R. von Huene, and J. R. Duncan.
Geology, Vol 1, No 1, p 19-22, September 1973. 7 fig, 8 ref.

Descriptors: *Sedimentation rates, *Sedimentation, *Pleistocene epoch, *Alaska, *Glaciation, Turbidity currents, Bottom sediments, Stratigraphy.
Identifiers: Aleutian trench.

Sediments originally deposited on the Alaskan Abyssal Plain have been depressed to form the eastern Aleutian Trench. Simultaneously, a wedge of horizontally bedded sediments, about 1 km thick at its axis, has been deposited in the trench. The time-transgressive facies change between this wedge of sediment and the abyssal-plain sediment sequence shows up as a discontinuity on seismic records. Sediment is being deposited up to 10 times faster in the trench than on the abyssal plain. Ninety percent of the sediment in the trench arrived there by moving down the trench wall as slumps or in turbidity currents, and has been partly redistributed by turbidity currents flowing in a channel along the trench axis; 7% has come from the Survey or Channel distribution system on the abyssal plain; and 3% is pelagic (mainly ice rafted). Sediments pass from a sandy facies near the trench wall to a silt-mud facies on the abyssal plain. Sediment fill in the Aleutian Trench is abnormally thick as a result of Pleistocene glaciation; Neogene trench-fill sediments would be less than 800 m thick. (Knapp-USGS)
W74-05720

ABRASION IN PLACE: A MECHANISM FOR ROUNDING AND SIZE REDUCTION OF COARSE SEDIMENTS IN RIVERS,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
S. A. Schumm, and M. A. Stevens.
Geology, Vol 1, No 1, p 37-40, September 1973. 2 fig, 17 ref. NSF Grant GA-38621.

Descriptors: *Bed load, *Abrasion, *Gravels, *Saltation, Sediment transport, Sedimentology, Particle size, Weathering.

Rounding and reduction in size and weight of coarse particles occur over a significantly shorter distance in a stream as compared to the distance of travel required to produce a similar result in tumbling barrel or flume. This suggests that either the known processes of wear are more effective in streams than in the laboratory or that other processes are at work. Investigations of riprap failure by hydraulic engineers provide data on the forces acting on coarse particles and particle behavior prior to downstream movement. The experiments demonstrate that lift forces acting on a submerged cobble are large and vary significantly with time. When this effect of lift is combined with drag forces, a particle vibrates in place without downstream movement. With increased velocity, the particle lifts off the streambed and saltates downstream to a new position of temporary stability. During high-velocity flow, abrasion of cobbles in place and the chipping and fracturing during saltation can be significant factors causing rounding and size reduction of coarse sediments in rivers. (Knapp-USGS)
W74-05721

THE INCOMPLETE FLOOD PLAIN,
Florida State Univ., Tallahassee. Dept. of Geology.
W. F. Tanner.
Geology, Vol 2, No 2, p 105-106, February 1974. 1 fig, 1 ref.

Descriptors: *Flood plains, *Earthquakes, *Sedimentation, Lakes, Topography, Geomorphology, Sedimentation rates.
Identifiers: *Incomplete flood plains.

Incomplete flood plains are warped in such a manner (probably by tectonic deformation) that their upper surfaces are not the two-dimensional planes that alluvial rivers ordinarily build. Incomplete flood plains are not marked by oxbow lakes and other evidence of channel migration, but rather by lakes, ponds, marshes, and swamps of various sizes and shapes. The Magdalena River valley of Colombia has an incomplete flood plain through almost 1,000 km of its length. (Knapp-USGS)
W74-05722

ANATOMY OF A SHOREFACE-CONNECTED SAND RIDGE ON THE NEW JERSEY SHELF: IMPLICATIONS FOR THE GENESIS OF THE SHELF SURFICIAL SAND SHEET,
Dames and Moore, New York.
L. Stahl, J. Koczan, and D. Swift.
Geology, Vol 2, No 3, p 117-120, March 1974. 4 fig, 1 tab, 9 ref.

Descriptors: *Beaches, *Continental shelf, *New Jersey, *Barrier islands, Geomorphology, Sedimentation, Topography.
Identifiers: *Shoreface ridges.

Falling within the site survey area for an offshore nuclear power facility, Beach Haven Ridge, New Jersey, is the most thoroughly investigated shoreface-connected ridge on the Atlantic shelf. Its stratigraphy clearly indicates that it is of Holocene age and was initiated at the foot of the shoreface, after passage of the retreating barrier, as the leading edge of the shelf surficial sand sheet. (Knapp-USGS)
W74-05723

SLOW MOVEMENT OF EARTH UNDER TROPICAL RAIN FOREST CONDITIONS,
Clark Univ., Worchester, Mass. Graduate School of Geography.
L. A. Lewis.
Geology, Vol 2, No 1, p 9-10, January 1974. 1 fig, 1 tab, 9 ref.

Descriptors: *Mass wasting, *Humid areas, *Tropical regions, Creep, Landslides, Slopes, Degradation(Slope), Erosion rates, *Puerto Rico, National forests.
Identifiers: El Yunque National Forest(P.R.).

In El Yunque National Forest, Puerto Rico, the average rates of soil movement are greater than rates in other forested areas and generally are greater than in other locales. Also, the velocity distribution indicates two zones of maximum movement. This phenomenon is not explained by normal creep behavior. For the wet tropics, theory must include the roles of throughflow and the distribution of plant roots, as well as the interaction between gravity and the individual expansion and constraction of soil particles. (Knapp-USGS)
W74-05724

MASS PROPERTY VARIABILITY OF SOME ESTUARINE SEDIMENTS,
Lafayette Coll., Easton, Pa. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W74-05725

DEVELOPMENT OF FLUTE-MARK ASSEMBLAGES: 1. EVOLUTION OF PAIRS OF DEFECTS,
Reading Univ. (England). Sedimentology Research Lab.
J. R. L. Allen.
Sedimentary Geology, Vol 10, No 3, p 157-177, November 1973. 13 fig, 3 tab, 10 ref.

Descriptors: *Sedimentary structures, *Erosion, *Bed load, Ripple marks, Turbidity currents, Density currents, Sedimentation, Sedimentology, Vortices, Mud, Scour.
Identifiers: *Flute marks.

Experiments using a bed of hardened plaster of paris dissolved by a turbulent water stream are a practical analogue of natural mud-bed erosion. Paired defects evolve into compound flute marks which at a critical age become marks indistinguishable from structures developed from single defects. The critical age increases as the relative spacing of the paired defects grows larger but decreases as their alignment approaches the mean flow direction. Growth of the compound marks follows similar laws to single flutes. A natural assemblage of flute marks may be expected during an early stage of development to show a progressive reduction in the number-density of the structures, as a consequence of the merging of marks generated from defects sufficiently closely spaced to have interacted during the time available. (Knapp-USGS)
W74-05726

CHEMICAL WEATHERING OF SERPENTINITE IN THE EASTERN PIEDMONT OF MARYLAND,
Maryland Geological Survey, Baltimore.
E. T. Cleaves, D. W. Fisher, and O. P. Bricker.
Geological Society of America Bulletin, Vol 85, No 3, p 437-444, March 1974. 6 fig, 7 tab, 27 ref.

Descriptors: *Weathering, *Maryland, *Degradation(Slope), Geomorphology, Geochemistry, Water chemistry, Clays, Mineralogy, Erosion, Residual soils, Saprolites.
Identifiers: *Serpentinite, *Schist.

Weathering processes in a small watershed underlain by serpentinite in the Piedmont of Maryland were studied by means of a mass balance technique and were compared with the processes operative in a watershed underlain by schist. The two terranes are downwasting at a rate of 2.4 m per million years, but chemical weathering much more strongly affects the serpentinite (2.2 m per million year) than the schist (1.2 m per million years). The serpentinite lacks a saprolite cover because resistate minerals are absent and alumina in the bedrock is scarce. In contrast, the schist contains both quartz and a source of alumina in the alumino-silicate minerals and, as a result, has a thick saprolite mantle. The hydrologic consequences in the serpentinite terrane compared with the schist watershed are increased flood-flow discharge, greater fluctuation in seasonal, instantaneous base-flow discharge, and pronounced seasonal fluctuations in total discharge. The serpentinite stream water averaged 205 ppm of total dissolved solids in the base flow compared to 25 ppm in the schist. Stream water from the serpentinite is of the magnesium bicarbonate type; that from the schist is sodium-calcium bicarbonate type. On the serpentinite, substantial land-surface reduction (denudation) is effected by chemical weathering; mechanical weathering is secondary. On the schist terrane, mechanical weathering is the primary agent that lowers the land surface, even though chemical weathering has reduced the rock mass by almost one-half. (Knapp-USGS)
W74-05729

FACTORS DETERMINING BED FORMS OF ALLUVIAL STREAMS,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.
V. A. Vanoni.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY3, Paper 10396, p 363-377, March 1974. 8 fig, 2 tab, 33 ref, append.

Descriptors: *Sedimentary structures, *Ripple marks, *Alluvial channels, Bed load, Dunes, Sediment transport, Hydraulic models, Equations, Sedimentation.

Laboratory and field data of bed forms of alluvial channels were analyzed according to similarity methods. The following variables are important in determining the bed forms of sand bed streams: flow depth, mean velocity, density, viscosity, median size of sediment, and the acceleration of gravity. The data thus analyzed are presented in six graphs of depth ratio against Froude number for each of six ranges of Reynolds number. This accounts for the effects of sediment size and water viscosity or temperature. Flume data indicate that the size distribution of the bed sediment also affects bed form. A relation is developed which predicts quite well the occurrence of ripple and dune beds. (Knapp-USGS)
W74-05735

EROSION CONTROL,
Soil Conservation Service, Stillwater, Okla.
W. L. Vaught.
In: Environmental Aspects of Geology and Engineering in Oklahoma; Proceedings of a Symposium of the Oklahoma Academy of Science, December 4, 1970, Stillwater: Annals of the Oklahoma Academy of Science, No 2, p 36-41, 1971.

Descriptors: *Erosion control, *Oklahoma, Soil erosion, Wind erosion, Urban runoff, Land use, Soil conservation.

Soil-erosion problems are of a complex nature. Large amounts of sediment, a product of soil erosion, now come from housing developments, road construction, and other nonagricultural areas. The upstream watershed program in Oklahoma is combating soil erosion on 9 million acres or 20% of the total area in Oklahoma. The 1,450 floodwater-retarding structures built under the programs have trapped 39 million tons of sediment. (Knapp-USGS)
W74-05741

LANDSLIDES AND RELATED PHENOMENA PERTAINING TO HIGHWAY CONSTRUCTION IN OKLAHOMA,
Oklahoma State Dept. of Highways. Research and Development Div.
C. J. Hayes.
In: Environmental Aspects of Geology and Engineering in Oklahoma; Proceedings of a Symposium of the Oklahoma Academy of Science, December 4, 1970, Stillwater: Annals of the Oklahoma Academy of Science, No 2, p 47-5
1971. 5 fig, 1 tab, 4 ref.

Descriptors: *Landslides, *Soil erosion, Ro construction, *Oklahoma, Geology, Geolo mapping.

Common engineering-geology problems Oklahoma include landslides, seepage, sinkhol and cave-ins, swelling (expansive) soils, hard-ro excavation, erosion, and sedimentation. Geolo maps and similar information can be used to pr dict the types and severity of these problem Field observation and experience allow an assoc tion of the problem with a particular geologic ro unit. For instance, a Geologic Province map can used for categorizing and classifying regionally c curring problems, and Geologic Unit maps can used when more detailed classification is necess ry. Depending on the type of design conti required, the types of maps derived allow e gineers to make proper decisions concerning t types, locations, and severity of engineerin geology problems. (Knapp-USGS)
W74-05743

SEDIMENT TRANSPORT AT LOW SHIELD PARAMETER VALUES,
Norconsult A/S., Oslo (Norway).
E. Helland-Hansen, R. T. Milhous, and P. C. Klingeman.
Journal of the Hydraulics Division, Americ Society of Civil Engineers, Vol 100, No HY1, 261-265, January 1974. 3 fig, 1 tab, 6 ref.

Descriptors: *Sediment transport, *Bed loa *Streamflow, Velocity, Turbulenc Discharge(Water), Shear stress, Traction, Flume Tractive forces.
Identifiers: *Shields parameter.

Sediment transport is possible at very low valu of the Shields parameter. Some methods of es mating the bed material movement in a stream a sume that below some critical shear stress t sediment transport rate is zero. Based on flume e periments, it is clear that there is some probabil of sediment transport at all levels of bed she stress. (Knapp-USGS)
W74-05835

A NEW SHEAR WAVE VELOCITY MEASUR MENT TECHNIQUE IN OCEAN BOTTOM SO SAMPLES,
New Hampshire Univ., Durham. Dept. Mechanical Engineering.
B. Celikkol, and P. M. Vogel.
Available from NTIS as COM 73-11913, $2. paper copy, $1.45 microfiche. Sea Grant Technic Report No. UNH-SG-112, July 1973. 12 p, 6 fig, tab, 19 ref. NOAA SG DC 1-36114.

Descriptors: *Soil investigations, Instrumentatio *Soil properties.
Identifiers: Shear wave velocity, Elastic prope ties, *Marine soils, Visco-elastic wave Velocimeters, *Ocean bottom soil.

An improved and convenient method is describe of obtaining the shear wave velocity of the soil t using inexpensive, portable and durable equi ment. The material seems to be adequate for so that are predominantly course sand or fin material which have a water content of 0.50 to pe haps 0.20. For soils that have a water content le than 0.20 it is difficult to press the probes into th soil. Therefore, if the shear wave velocity and a tenuation is needed for soil of low water conten the soil must be wetted to a higher water conten then the probes inserted, and then dried to th desired water content. For soils of water conte greater than 0.50, it is difficult to evaluate the pe formance of the velocimeter because it is n known whether or not a shear wave propagates soil of this type. If shear waves do propagate, th velocimeter must be judged inadequate for dete

minations of soils of high water content because then a water boundary forms at the surface of the probes. This makes an impenetrable boundary for transverse displacements. The precision of this system is adequate. By using the secondary pulse generator with a stable pulse length and an interval counter which measures time to 0.1 mu second one can obtain the transverse wave speed to three significant figures. (Sinha-OEIS)
W74-05918

THE PHYSICAL SETTING OF THE COLORADO RIVER BASIN,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 4A.
W74-05921

2K. Chemical Processes

THE DETERMINATION OF BARIUM BY FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY USING A MODIFIED GRAPHITE TUBE ATOMIZER,
For primary bibliographic entry see Field 5A.
W74-05444

A PRELIMINARY PROCEDURE FOR THE DETERMINATION OF CADMIUM IN BLOOD,
Department of Employment, London (England). Medical Services Div.
For primary bibliographic entry see Field 5A.
W74-05445

RING-DISK ELECTRODE STUDY OF THE ANODIC BEHAVIOR OF GOLD IN 0.2M SULFURIC ACID,
State Univ. of New York, Buffalo. Dept. of Chemistry.
S. H. Cadle, and S. Bruckenstein.
Analytical Chemistry, Vol 46, No 1, p 16-20, January 1974. 5 fig, 2 tab, 13 ref.

Descriptors: *Gold, *Anodes, *Electrochemistry, Zeta potential, *Electrodes, Chemical reactions.
Identifiers: *Ring disk electrodes, Dissolution, Sulfuric acid, Ion selective electrodes, Platinum ring electrodes, Gold disk-gold ring electrodes, Gold disk-platinum ring electrodes.

The dissolution of gold from a rotating disk electrode was studied in 0.2 M H2SO4. Gold dissolution was observed at potentials greater than plus 1.13 V vs SCE. The rate of dissolution was determined as a function of potential by collecting the gold on a platinum ring electrode. Gold dissolution was also observed during the reduction of gold oxide films. The quantity of this cathodically dissolved gold was found to be a function of the electrode rotation speed, and the amount of gold oxide reduced. The increase in cathodically produced soluble gold with increasing rotation speed was shown to obey first order heterogeneous kinetics. The oxidation state of the cathodically produced gold was found to depend on the potential at which the gold oxide was formed. If the disk electrode was oxidized at E sub D less than plus 1.45 V, Au(III) was the predominant species collected at the ring electrode. However, if the oxidizing potential was greater than plus 1.45 V, a significant quantity of Au(I) was also collected at the ring electrode. (Holoman-Battelle)
W74-05446

THE DETERMINATION OF A STABILITY CONSTANT FOR THE AQUEOUS COMPLEX ZN(OH)2 USING ANODIC STRIPPING VOLTAMMETRY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 5A.
W74-05455

THE DETERMINATION OF BORON IN SOLUTION TO SUB-P.P.B. CONCENTRATIONS BY HOLLOW-CATHODE EMISSION,
Virginia Univ., Charlottesville. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-05468

THE EXTRACTION-SPECTROPHOTOMETRIC DETERMINATION OF CHROMIUM (III) WITH 4-(2-PYRIDYLAZO)-RESORCINOL,
Hokkaido Univ., Sapporo (Japan). Lab. of Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W74-05470

THE SPECTROPHOTOMETRY AND SOLVENT-EXTRACTION BEHAVIOUR OF IRON(III), VANADIUM(IV AND V) AND TITANIUM(IV) CHELATES OF 1-(O-CARBOXYPHENYL)-3-HYDROXY-3-METHYLTRIAZENE,
Jadavpur Univ., Calcutta (India). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-05471

SYNERGIC SOLVENT EXTRACTION OF DIVALENT CATIONS WITH DECAFLUOROHEPTANEDIONE AND DI-N-BUTYLSULFOXIDE,
Hewlett-Packard Co., Avondale, Pa. Avondale Div.
For primary bibliographic entry see Field 5A.
W74-05472

THE APPLICATION OF PHOTO-OXIDATION TO THE DETERMINATION OF STABLE COBALT IN SEA WATER,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England).
For primary bibliographic entry see Field 5A.
W74-05473

SURFACTANT-SELECTIVE ELECTRODES. PART I. AN IMPROVED LIQUID ION-EXCHANGER,
Unilever Ltd., Port Sunlight (England). Unilever Research Lab.
For primary bibliographic entry see Field 5A.
W74-05474

GOLD TWIN-ELECTRODES IN THIN-LAYER ELECTROCHEMISTRY,
Wichita State Univ., Kansas. Dept. of Chemistry.
J. W. MacKay, and A. S. Allen.
Analytica Chimica Acta, Vol 67, No 2, p 395-402, December 1973. 6 fig, 20 ref.

Descriptors: *Electrochemistry, *Aqueous solutions, *Chlorides, Ions, Adsorption, Sodium chloride, Electrolytes, *Electrodes, *Volumetric analysis.
Identifiers: *Ion selective electrodes, Twin electrode system, Triangular sweep voltammetry, Voltammetry, Gold electrodes, Cyclic voltammetry, Perchloric acid.

The characteristics of a gold twin-electrode system in a thin-layer cell containing 0.1 M perchloric acid, and varying amounts of sodium chloride, were investigated by triangular sweep voltammetry. The 'adsorbed oxygen' layer starts to form above 1 V, and the peak from reduction of this layer shifts from 0.88 V to 0.65 V on changing the turn-around potential from 1.02 to 2.0 V. A distinct adsorption peak appears at 0.5 V, with cathodic peaks at 0.4 V and -0.1 V. Chloride adsorption is observed at 0.6 V, with desorption at 0.4 V. The dissolution of the gold electrode to gold(III) chloride occurs at 1.1 V; but this reaction is blocked above 1.2 V by the formation of the 'adsorbed oxygen' layer. The peak from the reduction of the gold(III) chloride is located at 0.7 V and is separable from the 'adsorbed oxygen' reduction peak. The electrode surface obtained from the reduction of gold(III) chloride shows characteristics different from those obtained by the reduction of the 'adsorbed oxygen' layer. (Little-Battelle)
W74-05475

NEUTRON IRRADIATION OF MERCURY IN POLYETHYLENE CONTAINERS,
Naval Undersea Center, San Diego, Calif.
For primary bibliographic entry see Field 5A.
W74-05476

A SIMULTANEOUS DETERMINATION OF ZINC AND CADMIUM,
Gustavus Adolphus Coll., St. Peter, Minn. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-05477

SEPARATION AND ANALYSIS OF MIXTURES OF CATIONIC SURFACE-ACTIVE AGENTS BY SALTING-OUT CHROMATOGRAPHY,
Kao Soap Co., Wakayama (Japan). Industrial Research Lab.
S. Fudano, and K. Konishi.
Journal of Chromatography, Vol 87, No 1, p 117-124, December 5, 1973. 6 fig, 2 tab, 15 ref.

Descriptors: *Separation techniques, *Volumetric analysis, Salts, Anion exchange, Resins, *Surfactants, *Chromatography, Methodology.
Identifiers: *Salting-out chromatography, *Cationic surfactants, Alkyltrimethylammonium chloride, Dialkyldimethylammonium chloride, Alkylpyridinium chloride, Alkylpyridinium iodide, Alkyldimethylbenzylammonium chloride, Hyamine 1622, Amberlite, Methanol, Elution.

The separation and analysis of mixtures of cationic surface-active agents by salting-out chromatography is described and some aspects of the separation mechanism of salting-out chromatography are discussed. The following cationic surfactants were symthesized and purified by recrystallization from acetone: alkyltrimethylammonium chloride (C12, C14, C16, C18); dialkyldimethylammonium chloride (C12, C14); alkylpyridinium chloride (C12, C14, C16, C18); alkylpyridinium iodide (C12, C18); alkyldimethylbenzylammonium chloride (benzalkonium chloride, C12, C14, C16, C18); and Hyamine 1622. The chromatographic conditions finally adopted were as follows: resin, Amberlite CG-4B; column, Sephadex (25 mm I.D. and 410 mm long); eluent, aqueous 45 percent (or 55 percent) methanol-0.5 M sodium chloride solution; column temperature, 40.0C; flow-rate, 0.7 ml/min; determination, two-phase titration method with bromophenol blue as indicator. Not only could a homologous series of cationic surface-active agents be separated quantitatively, but the separation and determination of the constituents of their mixtures also became feasible. It is presumed that cationic surfactants molecules are present in an ionic state and probably pass through ted by exchange of their counter ions for anions in the eluent. The solubility of a surfactant in an eluent decreases as the chain-length of the alkyl groups in the surfactant increases. Surfactant molecules with long alkyl groups can be easily salted out and adsorbed on the resin, and they therefore have large elution volumes. For this reason, dialkyldimethylammonium salts that have large hydrophobic groups were not eluted under the conditions mentioned above. The adoption of the gradient elution method, however, may not only enable these surfactants to be eluted successfully but also extend further the applicable range. (Mortland-Battelle)
W74-05481

TRANSPORT, FATE AND GEOCHEMICAL INTERACTIONS OF MERCURY, CADMIUM AND OTHER INORGANIC POLLUTANTS IN THE COASTAL LITTORAL-SALT MARSH ENVIRONMENT OF THE SOUTHEASTERN UNITED STATES.
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5B.
W74-05501

ORGANIC AND INORGANIC GEOCHEMISTRY OF SOME COASTAL PLAIN RIVERS OF THE SOUTHEASTERN UNITED STATES,
Georgia Inst. of Tech., Atlanta. School of Geophysical Sciences.
For primary bibliographic entry see Field 5B.
W74-05503

CHEMICAL CHARACTERISTICS OF DISSOLVED ORGANIC MATTER IN RIVER WATER,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 5B.
W74-05504

WATER FOR INDUSTRIAL DEVELOPMENT IN CALHOUN, CHICKASAW, CHOCTAW, GRENADA, MONTGOMERY, WEBSTER, AND YALOBUSHA COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 3E.
W74-05525

GROUND-WATER DATA FOR HARRIS COUNTY, TEXAS: VOLUME III--CHEMICAL ANALYSES OF WATER FROM WELLS, 1922-71,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-05528

DETERMINATION OF THE RATE OF TRIPOLY- AND PYRO-PHOSPHATE HYDROLYSIS IN SEDIMENTS,
Missouri Univ., Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W74-05542

A SUMMARY ON GROUND WATER IN THE HAN RIVER BASIN, REPUBLIC OF KOREA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W74-05546

BASE OF FRESH GROUND WATER--APPROXIMATELY 3,000 MICROMHOS--IN THE SACRAMENTO VALLEY AND SACREMENTO-SAN JOAQUIN DELTA, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W74-05553

AN ADDITIONAL LOCATION OF METALLIFEROUS SEDIMENTS IN THE RED SEA,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 2J.
W74-05554

EVOLUTION OF THE ISOTOPIC COMPOSITION OF LEAD IN ANCIENT MARINE BASINS (K VOPROSU OB EVOLYUTSII IZOTOPNOGO SOSTAVA SVINTSA V DREVNIKH MORSKIKH BASSEYNAKH),
Akademiya Nauk SSSR, Leningrad. Institut Geologii i Geokhronologii Dokembriya.
For primary bibliographic entry see Field 2F.
W74-05559

CUASES OF GEOGRAPHICAL DISTRIBUTION OF OXYGEN-18 AND DEUTERIUM IN THERMAL WATER OF THE SAYAN-BAYKAL MOUNTAINS (PRICHINY GEOGRAFICHESKOGO RASPREDELENIYA KISLORODA-18 I DEYTERIYA V TERMAL'NYKH VODAKH SAYANO-BAYKAL'SKOY GORNOY STRANY),
Akademiya Nauk URSR, Kiev. Instytut Fizychnoi Khimii.
V. Ye. Vetshteyn, I. S. Lomonosov, G. A. Malyuk, and Ye. V. Pinneker.
Akademiya Nauk SSSR Izvestiya, Seriya Geograficheskaya, No 5, p 122-128, September-October 1973. 2 tab, 15 ref.

Descriptors: *Geochemistry, *Isotope studies, *Oxygen isotopes, *Deuterium, *Thermal water, Thermal springs, Precipitation(Atmospheric), Air temperature, Permafrost, Water chemistry.
Identifiers: *USSR, *Sayan Mountains, *Baykal Mountains.

The isotopic composition of oxygen and hydrogen in thermal water of the Sayan-Baykal mountain range was investigated to determine their origin and mode of occurrence. Low concentrations of oxygen-18 and deuterium in thermal water attest to the important role of solid and liquid precipitation as sources of water supply. Insignificant enrichment of thermal water in oxygen-18, as evidenced in the Tsipa Depression, is associated most likely with saturation of these waters by deep crustal components. The concentration, if any, of magmatogenic waters in thermal water is extremely small as compared with the total amount of meteoric water and does not exceed 2%. Average air temperature, total atmospheric precipitation, and average annual content of oxygen-18 in precipitation in the Lake Baykal basin in 1904-58 are tabulated. Tabulated results of determinations of the isotopic composition of oxygen-18 and deuterium in thermal and surface waters and in atmospheric precipitation show that the oxygen-18 content in water samples investigated varies between minus 13.2% and minus 19.6% and that of deuterium, between minus 92% and minus 160%. (Josefson-USGS)
W74-05560

DETERMINATION OF SULFATE USING FERRIC ION-SELECTIVE ELECTRODE,
For primary bibliographic entry see Field 5A.
W74-05693

A FACTOR ANALYSIS OF SELECTED WATER QUALITY VARIABLES IN CENTRAL NEW JERSEY DURING 1960-1969,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Geography.
For primary bibliographic entry see Field 5B.
W74-05716

CHEMICAL WEATHERING OF SERPENTINITE IN THE EASTERN PIEDMONT OF MARYLAND,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 2J.
W74-05729

MEASUREMENT OF THE APPARENT DISSOCIATION CONSTANTS OF CARBONIC ACID IN SEAWATER AT ATMOSPHERIC PRESSURE,
Oregon State Univ., Corvallis. School of Oceanography.
C. Mehrbach, C. H. Culberson, J. E. Hawley, and R. M. Pytkowicz.
Limnology and Oceanography, Vol 18, No 6, p 897-907, November 1973. 7 tab, 23 ref. NSF Grants GA-17011 and GA-36075X, ONR Contract N00014-67-A-0369-0007.

Descriptors: *Sea water, *Water chemistry, *Carbon dioxide, Chemical potential, Aqueous solutions, Water temperature, Salinity.
Identifiers: *Dissociation constants, *Carbonic acid.

The apparent dissociation constants of carbonic acid in seawater were determined as functions of temperature (2-35 deg C) and salinity (1.9-4.3%) at atmospheric pressure by measurement of K'1 and the product K'1 K'2. At 3.5% salinity and 25 deg C the measured values were pK'1=6.000 and pK'2=9.115; at 3.5% and 2 deg C the measured values were pK'1=6.177 and pK'2=9.431. (Knapp-USGS)
W74-05731

NATURAL CHLORIDE POLLUTION, ARKANSAS AND RED RIVER BASINS,
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 5B.
W74-05742

LATERITIC DEEP WEATHERING OF GRANITE,
Western Australia Univ., Nedlands. Dept. of Soil Science and Plant Nutrition.
For primary bibliographic entry see Field 2G.
W74-05929

WATER RESOURCES DATA FOR NEW YORK, 1972: PART 2. WATER QUALITY RECORDS.
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 2E.
W74-05931

2L. Estuaries

SOURCES AND MOVEMENTS OF WATER--AN INTERIM REPORT.
Geological Survey, Washington, D.C. Water Resources Div.
Available from New England River Basins Commission, 270 Orange Street, New Haven, Conn. 06511. New England River Basins Commission Long Island Sound Regional Study, November 1973. 50 p, 19 fig, 5 tab, 5 append.

Descriptors: *Estuaries, *Sounds, *New York, *Water circulation, Water balance, Climatology, Water resources, Water sources.
Identifiers: *Long Island Sound.

Knowledge about the sources, distribution and movement of water in the Long Island Sound Region is summarized. Climatological factors such as temperature, wind and cloud cover that affect elements of the hydrologic system are also discussed. The region has an abundant supply of freshwater derived from precipitation and from inflowing streams. Of the total precipitation falling on the land each year, about half returns to the atmosphere by evapotranspiration, while the remainder ultimately discharges to streams and the Sound, either directly by overland flow or indirectly by downward percolation to the water table. Long Island is underlain by a large groundwater reservoir of generally good quality. It meets almost all the island's freshwater needs. Long Island Sound is a 1,300 square mile water body with estuarine characteristics in its western and central parts and embayment characteristics in its eastern third. Circulation is controlled principally by tidal currents modified by freshwater inflow, weather conditions and topography. Surface tidal current patterns in the central and eastern Sound are elliptical and counter-clockwise in direction. At the eastern end, surface water flows into Block Island Sound, while more dense and saline bottom waters flow into Long Island Sound. At the western end, surface water from the East River flows into the Sound and bottom waters move into the East River. (Knapp-USGS)
W74-05415

FLOCCULATION OF SUSPENDED SEDIMENT IN THE SEA,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5B.
W74-05441

SUMMER STORAGE OF ENERGY AND ITS USE FOR WINTER METABOLISM AND GONAD MATURATION IN AMERICAN PLAICE (HIPPOGLOSSOIDES PLATESSOIDES),
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
J. C. MacKinnon.
J Fish Res Board Can. Vol 29, No 12, p 1749-1759. 1972. Illus.
Identifiers: *American plaice, Annual, *Canada(St. Margaret's Bay-U.S.), *Energy storage, *Gonad maturation(Fish), Growth, Hippoglossoides-platessoides, Summer, Winter, *Fish metabolism.

American plaice (H. platessoides) in St. Margaret's Bay, Nova Scotia had an annual energy storage cycle in which a mature 35 cm female stored 92 kcal during the summer period and used this energy for metabolism (72 kcal) and gonad maturation (20 kcal) in winter months. An additional 21 kcal was stored in the ovary during the summer period. These energy changes occurred in a fish with a total energy content of approximately 300 kcal and an annual energy increment of 51 kcal due to growth in length. The annual energy variation in immature females and males was less than in mature females. A comparison of summer production (143 kcal, excluding gonad energy) with net annual production (51 kcal) for a 35 cm female plaice indicated that higher yields would be obtained by harvesting at the end of the summer period than by taking the same fish at the end of the overwintering period.--Copyright 1973, Biological Abstracts, Inc.
W74-05463

TRANSPORT, FATE AND GEOCHEMICAL INTERACTIONS OF MERCURY, CADMIUM AND OTHER INORGANIC POLLUTANTS IN THE COASTAL LITTORAL-SALT MARSH ENVIRONMENT OF THE SOUTHEASTERN UNITED STATES.
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5B.
W74-05501

HEAVY METAL FLUXES THROUGH SALT MARSH ESTUARIES,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5B.
W74-05502

A HYDROGRAPHIC INVESTIGATION OF WINYAH BAY, SOUTH CAROLINA AND THE ADJACENT COASTAL WATERS,
Georgia Inst. of Tech., Atlanta.
D. R. Bloomer.
Skidaway Institute of Oceanography Annual Progress Report (EPA Project No R-800372), Appendix D, p 171-235, January 1974. 32 fig, 17 ref.

Descriptors: *Currents(Water), *Estuaries, *Atlantic Coastal Plain, Water circulation, *Saline water intrusion, Tides, Winds, Path of pollutants, *South Carolina.
Identifiers: *Winyah Bay(SC).

Current measurements as well as temperature and salinity data were taken in the Winyah Bay estuary, South Carolina, and the adjacent coastal waters. The water motion in this area is controlled primarily by the dominant wind conditions and secondarily by the tide. Only during calm wind conditions (less than 10 knots) will the tidal effects alone be large enough to cause reversal of the shelf currents. There is evidence that an interaction between shelf and estuarine water motion may cause temporary interruptions in the otherwise smooth current variation following the change in the tide. The estuary may best be classified as partially mixed although these conditions may fluctuate greatly depending on position in the bay, stage in the tide, and rate of freshwater inflow. The Western Channel appears to be predominantly an ebb channel, particularly during periods of high runoff. The limit of saltwater intrusion proceeds beyond the confluence of the Peedee and Waccamaw Rivers during average runoff. Even during high runoff the wedge was never completely expelled from the estuary. (See also W74-05501) (Knapp-USGS)
W74-05505

THE OCCURRENCE AND DISTRIBUTION OF THE HYDROIDS OF THE GALVESTON BAY, TEXAS, AREA,
Texas A and M Univ., College Station. Dept. of Biology.
R. E. Defenbaugh, and S. H. Hopkins.
Available from NTIS Springfield, Va. 22151 as COM 73-11410, for $3.00 printed copy; $1.45 microfiche. Texas A and M University Sea Grant College Report TAMU-SG-73-210, June 1973. 202 p, 64 fig, 8 tab, 128 ref, 3 append. TAMU-SG-73-210.

Descriptors: *Aquatic animals, *Biological communities, Benthos, Aquatic life, Habitats, Systematics, Animal groupings, Phylogeny, Speciation, Varieties, *Texas.
Identifiers: *Hydroids, *Galveston Bay(Tex).

Examination of approximately 210 collections of hydroids from the Galveston Bay, Texas, area resulted in the identification of 29 species representing 19 genera in 10 families. Three of these species are provisionally described as new. Nine species are new records for Texas waters, one species is new for the Gulf of Mexico, and one species is new for the Atlantic coast, having been previously reported only from the North American Pacific coast. The species collected belong to one or more of three hydroid faunas: a sargassum fauna (restricted to or common on sargassum); an invertebrate epifauna; and a typical hydroid fauna (occurring on any suitable substrate. It is concluded that the hydroid fauna of the area has affinities with both the southern U.S. Atlantic coast and the Caribbean, but is closer to the Atlantic coast. (Knapp-USGS)
W74-05529

HYDROMORPHOLOGY OF ALLUVIAL CHANNELS OF LOWLAND RIVERS AND TIDAL ESTUARIES,
Nanking Hydrotechnical Scientific Research Inst. (Chinese People's Republic).
For primary bibliographic entry see Field 2J.
W74-05547

DISCHARGE PATTERNS IN TWO CREVASSES OF THE MISSISSIPPI RIVER DELTA,
Wisconsin State Univ., Oshkosh. Dept. of Geography.
D. J. Arndorfer.
Marine Geology, Vol 15, No 4, p 269-287, November 1973. 12 fig, 6 tab, 14 ref. ONR Contract N00014-69-A-0211-0003.

Descriptors: *Mississippi River, *Deltas, *Discharge(Water), *Sedimentation, Sediment transport, Tides, Alluvial channels, Bayous, Sedimentology, Levees, Floods.
Identifiers: Crevasses(Mississippi delta), Natural levees.

Variables which control water discharge in Rattlesnake Crevasse and, to a lesser extent, Little Lake Pond Crevasse, in the Mississippi River Delta are evaluated. Multiple-regression and analysis-of-variance procedures were used to assess the spatial and temporal interaction and changes in intensity of the variables. River stage, local drainage conditions, semi-monthly tide, diurnal tide, and wind determine discharge patterns in these two delta crevasses. The discharge of Rattlesnake and Little Lake Pond crevasses complements that of the primary distributaries of the Mississippi River Delta. During flooding tide, when seaward flow is inhibited in delta distributaries, the two crevasses attain maximum discharge. Flow in Rattlesnake Crevasse reverses direction during moderate and low river stages. (Knapp-USGS)
W74-05548

FISH FAUNA IN RIVER NAGARAGAWA AND ITS CHANGE FOR THE LAST SEVERAL YEARS IN RELATION TO RIVER POLLUTION (IN JAPANESE),
Seki High School (Japan).
For primary bibliographic entry see Field 5C.
W74-05580

HUMAN ECOLOGY AND COASTAL-ZONE POLLUTION,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5G.
W74-05597

DISEASES OF THE CULTIVATED PORPHYRA AT CULTURE BEDS WITH SPECIAL REFERENCE TO THE EFFECTS OF FERTILIZER PLANT EFFLUENTS (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
For primary bibliographic entry see Field 5C.
W74-05618

BIOLOGICAL MANAGEMENT AND CONSERVATION: ECOLOGICAL THEORY, APPLICATION AND PLANNING,
For primary bibliographic entry see Field 6G.
W74-05622

DEVELOPMENT OF A COMPUTER PROGRAM TO SIMULATE WIND WAVE GENERATION, REFRACTION, AND SHOALING IN THE GULF OF MAINE,
New Hampshire Univ., Durham. Engineering Design and Analysis Lab.
D. E. Thrall.
Available from NTIS as COM 73-11036, $3.00 paper copy. Sea Grant Publication UNH-SG-106, EDAL Report No. 113, March 1973. 48 p, 10 fig, 29 ref, 3 append. NOAA SG 2-35244.

Descriptors: *Computer programs, *Refraction(Water waves), *Winds, Maine.
Identifiers: *Wind wave generation, *Shoaling, Gulf of Maine, Wave paths.

The modification of an existing wave refraction program to include the effect of wind and its application to the Gulf of Maine is described. The selected refraction program plots the predicted wave paths, in addition to presenting them in numerical form. This feature makes the program valuable for teaching a coastal engineering class or for demonstrating coastal processes to the public domain in site selection hearings on offshore construction. Such graphic demonstration permits a much better conceptual understanding by the general public than is possible through numerical presentation of data. Judiciously used in conjunction with other decision-making tools, the graphic computer model should greatly improve mutual understanding between the technocrats and the public on coastal questions. (Sinha - OEIS)
W74-05695

A WAVE AND CURRENT INVESTIGATION IN THE NEARSHORE ZONE,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
W. L. Wood, Jr.
Available from NTIS as AD-768 318, $4.75 paper copy, $1.45 microfiche. Final Report, June 1973. 149 p, 37 fig, 73 ref, 2 append. ONR N00014-68-A-0109-0002.

Descriptors: *Turbulence, *Waves(Water), *Wavelengths, *Surf, Currents(Water).
Identifiers: Nearshore, *Bottom friction, *Breakers, Prediction equation, Wave height, Surface waves.

A spatial resolution method was developed for determining wave lengths in the surf. It prevents the error introduced due to rapidly transforming waves which arises in conventional calculated wave length determinations. Subsurface photographic studies on particle velocities in breaking waves indicated both horizontally dominant and vertically dominant flow paths beneath the crests of breaking waves. Breaker height decay analysis shows that turbulence due to breaking dominates bottom friction. A prediction equation is generated which will predict the exponential decay of wave height as a function of distance shoreward from the break point. A complete wave shape classification system was developed for evaluating stability and energetics of the surf zone. It is used in conjunction with a two dimensional time projection of the free surface to evaluate nearshore surface wave behavior. (Sinha - OEIS)
W74-05699

MIXING OF SALINITY-STRATIFIED WATER BY PNEUMATIC BARRIERS. REPORT I: PRELIMINARY INVESTIGATIONS. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
W. H. McAnally, Jr.
Available from NTIS as AD-762 132, paper copy $3.00, microfiche $1.45. Research Report H-73-4, June 1973. 23 p, 7 fig, 1 tab, 3 ref.

Descriptors: *Estuaries, *Mixing, *Salinity, Sedimentation, Bubbles, *Saline water barriers, *Stratification.
Identifiers: *Bubble screens, *Pneumatic screen.

Preliminary tests were conducted to identify the process involved in mixing salinity-stratified bodies of water by means of a pneumatic (bubble) screen. Salinity, velocity, and photographic data from these tests serve as a basis for planning experiments that will ultimately develop scaling relations for the use of pneumatic screens as mixing devices. In a two-dimensional flume with an initially two-layer, density-stratified system the flow pattern created by the operation of a pneumatic screen is a three-layer system. This flow was shown by flume tests using dye tracers on each side of the screen. A circulation cell is formed that draws water toward the pneumatic screen in the upper and lower layers, mixes the different-density waters in the immediate vicinity of the screen, and discharges the mixture as an intermediate-density wedge flowing away from the screen along the initial density interface. The results suggest that the pneumatic screen may be modeled by producing scaled currents in a hydraulic model by whatever means is convenient, thus avoiding problems of scaling the pneumatic screen apparatus. (Sinha-OEIS)
W74-05701

THE STRUCTURE OF MANAGEMENT AND PLANNING FOR THE COASTAL ZONE,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
J. M. Armstrong.
Available from NTIS as COM 73-11551, PC$3.25, microfiche $1.45. Sea Grant Publication. Paper presented at Woods Hole National Workshop on Critical Problems of the Coastal Zone, Woods Hole, Massachusetts, June 2, 1972. 25 p.

Descriptors: *Coasts, *Natural resources, Management, Planning.
Identifiers: *Coastal zone.

Coastal zone management is the process of developing an understanding of the coastal zone as a system, using this knowledge to create a dynamic plan for its best use, and implementing and enforcing that plan. Since the coastal zone is a national resource, a national coastal zone management policy responsive to the needs and values of the citizenry should be established by the federal government. Consideration should be given to making provisions for such a policy to be administered by a single federal agency with coordination responsibility for other federal agencies with coastal zone responsibilities. The proposed policy should result in the enactment of appropriate and adequate legislation. (Sinha-OEIS)
W74-05702

MARINE STUDIES OF SAN PEDRO BAY, CALIFORNIA. PART I: CIRCULATION PATTERNS IN LOS ANGELES-LONG BEACH HARBOR DROGUE STUDY ATLAS AND DATA REPORT,
University of Southern California, Los Angeles.
D. F. Soule, and M. Oguri.
Available from NTIS as Com 73-11466 PC$4.25 microfiche $1.45. Sea Grant Publication No. USC-SG-6-72, December 1972. 113 p, 3 ref, numerous charts and tables.

Descriptors: California, *Circulation, *Harbors, *Water circulation, Data collections, Maps.
Identifiers: San Pedro Bay(Calif), Drogue study atlas.

A drogue study was carried out on June 13-14, 1972. The reduced data are presented from that study. A total of 57 drogues were deployed, of which 47 were recovered. Three sightings taken for each drogue on approximately half hour intervals were used to calculate by computer program and by manual triangulation the most probable positions. Elapsed time, wind and speed measurements are also entered in the computer print-out. Data are presented for each of the 47 drogues for which adequate sightings were obtained. Each data sheet is accompanied by a computer plot of the drogue track in the harbor. Summary plots of all drogues released in the morning, in the afternoon, at the surface, at 10-ft depths or at 20-ft depths are presented. Plots are included of the net movements of one morning drogue and one afternoon drogue from each station for each depth. Net movements indicate the over-all movement of water throughout the entire period given. The area of Fish Harbor and the region east of it show a high level of incursion and little circulation. This is of particular importance since the cannery and sewer outfalls are presently located to the east of the Fish Harbor area, and recreational installations are planned as extensions of the Fish Harbor east jetty. (Sinha-OEIS)
W74-05708

EFFECTIVENESS OF SEQUENTIAL PHOTOGRAPHY FOR COASTAL OCEANOGRAPHY,
Virginia Inst. of Marine Science, Gloucester Point.
M. Nichols, G. Thompson, M. Kelly, and L. Castiglione.
Available from NTIS as AD-760 713 PC$3.00 microfiche $1.45. Final Report Prepared for NOAA Spacecraft Oceanography Project and Office of Naval Research, November 1972. 167 p, 5 tab, 65 ref, 5 append. ONR N00012-71-C-371, N00014-72-C0268.

Descriptors: Chesapeake Bay, *Photography, Plankton, Phytoplankton, Environment, *Color, *Remote sensing, Suspended solids, Sediments, Oceanography, Plankton.
Identifiers: James River Estuary, *Densitometry, Water masses, Scientific satellites, *Time sensing, Temporal changes, *Tonal patterns.

Dynamic features of coastal waters can be detected and monitored in sequential photography by: (1) pattern interpretation, (2) simple comparative analyses, (3) matching of positive-negative pairs, and (4) comparative densitometry. Procedures for densitometric analyses of temporal changes are given. Application of the procedure is demonstrated by analyses of tones representing suspended sediment and plankton in the James estuary and lower Chesapeake Bay. Field and photographic studies revealed four types of water color boundaries that form either in local convergence zones of secondary currents or where water masses of different origin meet. Color changes were partly due to sediment concentration differences and were sometimes manifest by microplankton community changes, but the relationships are complex and variable. (Sinha-OEIS)
W74-05711

THE INTERDEPENDANCE OF MARINE AND ESTUARINE ECOSYSTEMS IN SOUTH AFRICA,
Natal Univ., Durban (South Africa). Oceanographic Research Inst.
For primary bibliographic entry see Field 5B.
W74-05713

THE NET CIRCULATION IN THE WEST PASSAGE OF NARRAGANSETT BAY,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
R. H. Weisberg, and W. Sturges, III.
Available from NTIS as AD-764 646 PC$4.25 microfiche $1.45. Technical Report Ref. No. 3-73, March 1973. 96 p, 46 fig, 18 tab, 25 ref, 4 append. ONR N00014-68-A-0215-0003.

Descriptors: Rhode Island, *Estuaries, Bays, *Water circulation, *Winds, Stratification, Sea breezes.
Identifiers: Narragansett Bay(RI), Water transport.

Narragansett Bay is a weakly stratified estuary comprised of three connecting passages of varying depths. The vertical distribution of horizontal velocity was observed in the West Passage using moored current meters. The primary objective was the analysis of the net circulation, i.e., the motion exclusive of the periodic tides. The net transport of water through the West Passage was observed to be seaward or landward over the entire water column for several days duration, with typical wind induced transport fluctuations of plus or minus 500 cu m/s. Hence, a net transfer of water flowing either way in response to the wind. Wind is concluded to be the dominant mechanism driving the net circulation in the West Passage of Narragansett Bay. This is in contrast with the classical views of gravitationally convected net estuarine circulation. (Sinha-OEIS)
W74-05714

MASS PROPERTY VARIABILITY OF SOME ESTUARINE SEDIMENTS,
Lafayette Coll., Easton, Pa. Dept. of Geology.
R. W. Faas.
Sedimentary Geology, Vol 10, No 3, p 205-213, November 1973. 3 fig, 3 tab, 13 ref.

Descriptors: *Bottom sediments, *Estuaries, Shear strength, Chesapeake Bay, Moisture content, Specific gravity, Physical properties, Density, Mass, Statistics, Statistical methods, *Virginia.
Identifiers: *York River estuary(Va).

Bottom sediments from two areas of the York River Estuary of southeastern Virginia were systematically sampled to depths of 40 cm and analyzed for water content, unit weight, and shearin

rength. The samples fell into: (1) a coarse-ained group of clayey sands, silty sands, and nd-silt-clays; and (2) a fine-grained group of silty ays and clayey silts. Analysis of variance etween both groups revealed distinct differences the mass properties. Means, variances, and efficients of variation for each parameter were termined and made possible a statistical charac-rization of each sediment type. The data esented may be used to predict expectable lues of mass properties for similar sediments, ving experienced similar depositional histories. napp-USGS)
74-05725

LUSHING OF COASTAL EMBAYMENTS BY HANGES IN ATMOSPHERIC CONDITIONS,
edford Inst., Dartmouth (Nova Scotia). Atlantic ceanographic Lab.
. A. Heath.
imnology and Oceanography, Vol 18, No 6, p 9-862, November 1973. 8 fig, 7 tab, 10 ref.

escriptors: *Water circulation, *Bays, Estuaries, *Canada, Currents(Water), Winds, eteorology, Tides, Waves(Water), Surges, iches, Tidal effects.
entifiers: St. Margaret's Bay(N.S.), Halifax Har-r(N.S.), Strait of Canso(N.S.).

e circulation in several coastal embayments on e east coast of Nova Scotia, Canada, is induced changing atmospheric conditions. In summer d fall when the bays have essentially a two-yered vertical density distribution, quasi-riodic changes in wind and atmospheric pres-re associated with moving atmospheric sturbances produce a quasi-periodic flow which out of phase between the layers. Correlation tween the observed flow and atmospheric rameters together with results from a simple o-layered model indicate that the flow is obably produced by wind forcing. The observed eeds in the flow are of the same size as those in e mean circulation. The generation of the fluc-ating flow does not depend on the form of the ys and, therefore, this type of flow should be oduced in bays on other coasts where periodic anges in atmospheric pressure associated with nd variation are observed. (Knapp-USGS)
74-05730

ATER EXCHANGE IN TWO-LAYER RATIFIED WATERS,
yal Inst. of Tech., Stockholm (Sweden). ydraulic Lab.
Hyden.
urnal of the Hydraulics Division, American ciety of Civil Engineers, Vol 100, No HY3, per 10402, p 345-361, March 1974. 8 fig, 1 tab, 12 f, append.

scriptors: *Stratified flow, *Gradually varied w, Internal waves, *Mathematical models, ydraulic models, Estuaries, Numerical analy-, Mixing, *Bays.

mathematical model of two-layer stratified flow nsiders one-dimensional and radial flows. The merical solution is based on the method of aracteristics. The reliability of the mathematical del was investigated with one-dimensional oratory experiments and a hydraulic model of a l bay. Agreement between calculations and ex-iments was achieved but the calculations are e consuming. (Knapp-USGS)
74-05736

BILL TO AUTHORIZE A PROGRAM TO VELOP AND DEMONSTRATE LOW-COST EANS OF PREVENTING SHORELINE ERO-ON.
r primary bibliographic entry see Field 6E.
74-05747

A BILL TO BE ENTITLED AN ACT RELATING TO COASTAL ZONE MANAGEMENT.
For primary bibliographic entry see Field 6E.
W74-05761

COASTAL ISLAND TRUSTS.
For primary bibliographic entry see Field 6E.
W74-05762

COUNTY OF FREEBORN V. BRYSON (DECLARATORY JUDGMENT ACTION CONCERNING PORTIONS OF A NATURAL WILDLIFE MARSH).
For primary bibliographic entry see Field 6E.
W74-05765

THE VALUE OF THE TIDAL MARSH,
Georgia Univ., Athens. Inst. of Ecology.
J. G. Gosselink, E. P. Odum, and R. M. Pope.
Work Paper No. 3, May 1, 1973. 32 p, 6 tab.

Descriptors: *Tidal marshes, *Coastal marshes, *Aquatic environment, *Marsh management, *Land management, Wildlife management, Drainage, Watersheds, Estuary, Estuarine environment, Land development, Land reclamation, Surface waters, Swamps, Tides, Waste disposal, Sewage disposal, Pollution control, Sewage treatment, Fishlife, Fisheries, Shellfish, Nutrients, Nutrient requirement, Essential nutrients, Water quality.
Identifiers: *Coastal zone management.

Tidal marshlands depend in great part for their biological richness on fresh water nutrients. The value of the tidal marsh is dependent on the normal quality and quantity of nutrient feeding systems from inland or upland sources. For this reason land use planning and development for both agricultural and urban purposes must consider the stability and growth of the tidal marsh areas. Because of the tidal activity which faces these marshes daily it has been estimated that over 50% of the organic matter and nutrients which feed and support surrounding estuarine environments are produced in the tidal marsh. These nutrients support wildlife, plants and trees, fish and shellfish, all of which could not survive in the nursery stage without the life-substances derived from the tidal marshes. Land developers and population increases are exerting strong pressures to fill marshlands for commercial, industrial and residential use. Among the uses which most threaten the tidal marsh are careless planning; industrial, agricultural and urban sewage disposal; and chemical pollution. (Silber-Florida)
W74-05782

WHO GOVERNS LOCAL WATERS,
Miami Univ., Fla. Ocean Law Program.
For primary bibliographic entry see Field 6E.
W74-05784

LAFAYETTE PUBLIC HEARING TESTIMONY.
Louisiana Advisory Commision on Coastal and Marine Resources, Baton Rouge.
September 7, 1972. 30 p.

Descriptors: *Louisiana, *Marshes, *Coasts, *Management, *Planning, State governments, Administrative agencies, Pollution, Pollution control, Environment, Environmental effects, Environmental sanitation, Wildlife habitats, Fishlife, Fisheries, Water quality, Water quality control, Land use, Land management, Land development, Drainage, Floods, Flood control, Flood prevention, Waste disposal, Sewage disposal, Channelization, Estuaries, Watersheds, Groundwater, Agriculture, Industry, *Coastal zone management.

Various agricultural, industrial, governmental and citizens' groups addressed the Coastal and Marine Resources Commission hearing on coastal zone and resource problems. Management and development of the region were keynote topics. Rivers, seaports, shipping, oil and mineral industries, wildlife, watersheds and estuaries, fisheries and canneries, recreation and scenery, drainage, flooding and conservation are all competing and must be contended with in planning the future development and management of the region. Pollution control and environmental preservation were the primary concerns of the citizens' groups, as were land development policies. Water resources development and the marine sciences were also of concern, particularly the vast food potential yet to be harvested from the sea. Consideration of the public health, welfare and livelihood was also brought to the Commission's attention. Soil and water conservation, erosion control, wildlife protection and pollution control and waste disposal were considered. (Silber-Florida)
W74-05785

LAKE CHARLES PUBLIC HEARING TESTIMONY.
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
October 5, 1972. 38 p.

Descriptors: *Louisiana, *Coasts, *Marshes, *Management, *Planning, State governments, Administrative agencies, Pollution, Pollution control, Environment, Environmental effects, Environmental sanitation, Wildlife, Wildlife habitats, Fishlife, Fisheries, Water quality, Water quality control, Land use, Land management, Land development, Drainage, Floods, Flood control, Flood protection, Waste disposal, Sewage disposal, Channelization, Estuaries, Watersheds, Oily water, Groundwater, Contaminants, Agriculture, Industry.
Identifiers: *Coastal zone management.

The problems and importance of the Lake Charles region are considered. In a hearing held October 5, 1972, the uniqueness of the state's 7 million acres of coastal lands and its renewable natural resources and abundant mineral resources were stressed. The commercial fishing industry of the state depends upon the perpetuation of this coastal zone and is of national importance, representing 23% of the country's production of fish. The conflict arises between those interests dependent upon undisturbed natural resources and those which require disturbance of the environment to obtain their resources. Testimony and suggestions concerning the development and coastal zone management plans of the region were received from various governmental, agricultural and industrial interests familiar with the region, including the rice and soybean industries, drainage districts, fisheries and canneries, the League of Women Voters, shipping and dock facilities, and the State Conservation Commission. Some subjects of intensive study include: salt water intrusion, wildlife habitat preservation, pollution control, water quality, land use control, drainage, flooding, solid waste management, shipping, spills, channelization, estuary and watershed preservation and ground water contamination. (Silber-Florida)
W74-05786

CAN WE SAVE OUR SALT MARSHES,
Connecticut Agricultural Experiment Station, New Haven.
S. W. Hitchcock.
National Geographic, Vol 141, p 729-765, June 1972. 2 illus.

Descriptors: *Coastal marshes, *Salt marshes, *Marsh management, *Wildlife conservation, *Fish reproduction, *Commercial fish, Tidal marshes, Shallow water, Erosion, Mudflats, Water level fluctuations, Estuaries, Ocean currents, Tidal waters, Chemicals, Sewage, Wetlands.
Identifiers: Coastal zone management.

Salt marshes are disappearing before the onslaught of factories, dump and fill, and homes with a seaward view. Chemicals and sewage pollute the wetlands and developers rout the sportsmen and commercial fishermen. Seventy-five species of fish, at least, spend part of their lives in the salt marshes. The grass that developers destory is the basis of marsh life. The marsh vegetation supplies food and nutrition to many species including fiddler and blue-claw crabs. Many species gow in the confines of the marsh and then go out into the oceans. The marsh forms when waves shape sands into offshore barriers. Tidal creeks cut through these bars, flooding the coves behind them twice daily with seawater. Cordgrass sprouts in the shallows which slows tidal currents causing them to deposit their silt. This forms a floor of nutritive mud. During low tide many nutrients are flushed out to marine life offshore. Salt hay is grown in marshes and is in demand as mulch for gardens and strawberry beds. Wetlands are prime areas for development and are worth up to $110,000 an acre. Already many marshes have been destroyed. Still others are being used as garbage dumps and factory sites. (Sperling-Florida)
W74-05803

JACK AND THE DRAGLINE,
W. Blassingame.
Audubon, Vol 75, No 3, p 53-59, May 1973. 1 map, 1 photo.

Descriptors: *Florida, *Salt marshes, *Coastal marshes, *Estuaries, Aquatic hibitats, Channel improvement, Dredging, Administrative agencies, Gulf coastal plain, State governments, Regulation, Permits, Federal government, Economic aspects, Political aspects, Legal aspects, Legislation.
Identifiers: *Coastal waters, *Fill permits, Administrative regulations.

The development of the Big Bend area of North Florida is discussed. The Big Bend is a stretch of about three-hundred miles of saltwater marshes and winding creeks. These marshes produce and shelter more sealife than all the rest of Florida including the Everglades. They are presently being threatened by dredging and filling operations which destroy the estuarine life. Many dredging operations were taking place without the proper permits although both a state and federal permit are required to dredge. The developers have great influence over county commissions, and high state officials. Additionally, even environmentally-minded officials cannot prevent what old laws allow. For example, a Florida statute defines the position of the mean high-tide line at 1.4 feet above sea level. Along the table-flat coast, an inch may mean a half-mile or more of salt marsh. A better solution might be like that of the Georgia statute which defines its estuarine areas as all tidally influenced waters, marshes, and marshlands lying within a tide elevation range of 5.6 feet above mean tide level and below. (Sperling-Florida)
W74-05804

ENVIRONMENTAL LAW--ZONING--ORDINANCE PROHIBITING FILLING OF WETLANDS ADJACENT TO NAVIGABLE WATERS, WITHOUT PERMIT IS CONSTITUTIONAL EXERCISE OF POLICE POWER NOT REQUIRING COMPENSATION.
For primary bibliographic entry see Field 6E.
W74-05815

HYDRODYNAMICAL STABILITY OF SALT WEDGE,
Washington Univ., Seattle. Dept. of Oceanography.
F. A. Lee.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY1, Paper 10276, p 17-24, January 1974. 4 fig, 6 ref, append. NSF Grant GA-30745X.

Descriptors: *Saline water intrusion, *Estuaries, *Stratified flow, Streamflow, Open channel flow, Hydraulics, Hydrodynamics, Mixing, Saline water-freshwater interfaces, *Shear, Fluid mechanics.
Identifiers: *Salt wedges.

The hydrodynamical stability of a salt wedge is described in terms of a simple example consisting of two layers of fluids in uniform shear. The upper fluid is lighter than the lower fluid and is bounded by a free surface at the top. Salt wedge stability was studied through the growing and decaying modes of the system. Neutral stability curves are given in terms of the wave number and the thickness ratio of the upper layer to the shear layer. The stabilizing influences of the free surface and the interface are dependent on the wave number. Critical values of the dimensionless parameter are predicted to occur between 0.1 and 0.6 (depending on the thickness of the upper layer), below which stable flows can persist; its minimum value (0.1) agrees with experimental measurements. (Knapp-USGS)
W74-05825

HYDRAULICS AND THERMAL DISPERSION IN AN IRREGULAR ESTUARY,
General Electric Co., Philadelphia, Pa. Re-Entry and Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W74-05828

THE LAND WATER INTERFACE IN AN URBAN REGION: A SPATIAL AND TEMPORAL ANALYSIS OF THE NATURE AND SIGNIFICANCES OF CONFLICTS BETWEEN COASTAL USES,
Washington Univ., Seattle. Div. of Marine Resources.
For primary bibliographic entry see Field 6B.
W74-05872

FISHES, MACROINVERTEBRATES, AND HYDROLOGICAL CONDITIONS OF UPLANDS CANALS IN TAMPA BAY, FLORIDA,
National Marine Fisheries Service, St. Petersburg Beach, Fla. Gulf Coast Fisheries Center.
For primary bibliographic entry see Field 5C.
W74-05916

PRIMARY PRODUCTIVITY IN A NUTRIENT-LIMITED TROPICAL ESTUARY,
Hawaii Inst. of Marine Biology, Honolulu.
For primary bibliographic entry see Field 5C.
W74-05939

RESTRUCTURING OF RIVER BANKS AND SECONDARY POLLUTION: STUDY OF EUTROPHICATIONS IN PORT AREAS, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
For primary bibliographic entry see Field 5C.
W74-05950

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

HIGHLY MINERALIZED GROUNDWATER AND ITS UTILIZATION (PODZEMNYYE VODY POVYSHENNOY MINERALIZATSII I IKH ISPOL'ZOVANIYE),
M. R. Nikitin.
Akademiya Nauk SSSR Vestnik, No 11, p 52-58, November 1973. 3 fig.

Descriptors: *Water utilization, *Desalinatio *Saline water, *Brackish water, *Groundwate Groundwater resources, Freshwater, Maps.
Identifiers: *USSR, *Mineralization.

The vast resources of freshwater in the Sovi Union are unevenly distributed. As a result, ma regions in southern European Russia, We Siberia, Kazakhstan, and Soviet Central Asia a experiencing a water deficit. This deficit can remedied or alleviated by (1) more rational use local freshwater resources; (2) introduction of e cess water supplies from other regions; and maximum utilization of local brackish and sali waters with a dissolved-salts content in the 1 to g/liter range. First generalizations of data brackish and saline groundwater in the USSR as possible water-supply source were made by i stitutes of hydrogeology and engineering geolo in Moscow (VSEGINGEO) and in Tashke (GIDROINGEO) in 1965-69. Prospects of usi highly mineralized groundwater depend mainly progress in saline water conversion. Although t cost of desalting is still relatively high, interest removal of salts from water has been stimulat by the degree of development and industrial app cation of distillation, freezing, electrodialysis, a reverse osmosis. Schematic maps show the di tribution of brackish and saline groundwater in t USSR and the division of the country in provinces based on the geographic and stra graphic occurrence of groundwater. (Josefso USGS)
W74-05565

METHOD FOR MAKING A HOLLOW FIBE SEPARATORY ELEMENT,
Dow Chemical Co., Walnut Creek, Calif.
H. I. Mahon, G. C. Doss, D. A. Gavin, and D. B. Vang.
Available from NTIS as PB-220 737, $3.00 pap copy; $1.45 microfiche. Department of the Inte or, Office of the Solicitor Patent Application Se al Number 206 793, December 1971. 16 p.

Descriptors: *Patents, *Desalination, Brine *Separation techniques.
Identifiers: *Hollow fiber elements.

A process for making hollow fiber tube bundl which are usefully employed as separatory el ments in various fluid separation devices f desalination of brines and like dialytic and osmot separation purposes is described. Similar tul bundles prepared from plastic hollow fibers m also be used for heat exchange and other purpose It is of special interest to prepare tube bundl composed of a large number of permeable, hollo fibers of very small diameter for desalination ar other medical purposes such as a blood oxygen tor, artificial kidney and the like. A moving belt hollow fibers is prepared by winding a continuo length of hollow fiber (or fibers) transverse around a pair of moving guide members. The mo ing fiber belt is convolutely wound upon an ax generally transverse to the direction of moveme of the belt to form a fiber bundle. A band of res is applied to at least one transverse section of t hollow fiber and subsequently solidified to form tube sheet. The separatory element is the prepared by cutting the tube sheet in a plar generally perpendicular to the bundle axis to for a tube sheet face portion having open fiber en terminating therein. (Sinha - OEIS)
W74-05694

METHOD OF MAKING SODIUM CHLORID CONCENTRATE FROM SEA WATER,
Dow Chemical Co., Midland, Mich.
J. S. Best.
U.S. Patent No. 3,779,030, 3 p, 1 fig, 9 ref; Offici Gazette of the United States Patent Office, V 917, No 3, p 865, December 18, 1973.

Descriptors: *Patents, *Arctic, Ice, *Sea wate Freshwater, *Sodium chloride, Potable wate Equipment, *Desalination processes.

The method comprises the following steps: (a) adding sodium chloride to sea water to form an admixture having a concentration of sodium chloride within the range of 15 to 25 weight per cent; (b) cooling the admixture to a temperature within the range of 0 deg F to -8 deg F, whereby ice crystals are formed; (c) separating the ice crystals from the residual sodium chloride concentrate; (d) adding fresh sea water to the residual concentrate to form a second admixture having a sodium chloride concentration within the range of 15 to 25 weight per cent; and (e) recycling the second admixture through steps (b) - (e). In the Arctic the sodium chloride can be used as an additive to crude oil in Arctic pipelines to prevent freezing; the water may be used as drinking water. (Sinha-OEIS)
W74-05887

METHOD AND APPARATUS FOR DISTILLING FRESHWATER FROM SEAWATER,
E. E. H. Koivisto, and R. V. J. Saari.
U.S. Patent No. 3,783,108, 5 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 918, No 1, p 413, January 1, 1974.

Descriptors: *Patents, *Desalination, *Evaporation, *Condensation, *Distillation, Seawater, Freshwater, Equipment, Desalination apparatus.

Seawater pumped from the warm surface layers of the sea, or from a basin warmed by the sun or warmed by the low-temperature waste heat of a power plant or industrial process, is evaporated and the vapor produced is condensed by colder seawater. Non-condensable gasses dissolved in the water to be evaporated are removed before the water enters the evaporators and after the gasses have passed through the condensers. The water to be evaporated flows through a plurality of consecutive evaporators located at a roughly barometric height above sea level, in which part of it is evaporated and the rest returned to the level from which it was pumped into the evaporators. The vapor produced in the evaporators is condensed in corresponding condensers, which are cooled by colder seawater. The non-condensable gasses can be pumped out by mixing them with the cooling water leaving the condensers. (Sinha-OEIS)
W74-05901

3B. Water Yield Improvement

SUBSURFACE ASPHALT MOISTURE BARRIERS IN SANDY SOILS,
Delaware Univ., Newark. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W74-05412

THE MODIFICATION OF GREAT LAKES WINTER STORMS,
National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
I. K. Weickmann.
Technical Report ERL 265-APCL 26, January 1973. 103 p, 84 fig, 7 tab, 49 ref.

Descriptors: *Snowfall, *Weather modification, Great Lakes, Great Lakes Region, Cloud seeding, Mathematical models, Snow.

The mesoscale structure of Great Lakes winter storms shows that the heaviest precipitation falls near the shorelines and decreases in intensity further downwind. This is partly caused by the diminishing intensity of the convective cloud systems as they move inland and away from the warm convective moisture source, and partly because the more intensive convective clouds produce heavy precipitation particles, like graupel and rimed snowflakes, that fall close to the shore while the lighter particles are carried farther inland. Consequently, if lighter precipitation particles could be formed through overseeding the clouds, the snow would be carried away from the shorelines and advected over a larger inland area. This was tested by seeding from the ground and air, tracking the seeding agent through the cloud system with an airborne freezing nucleus counter, and analyzing AgI nuclei in the precipitated snow crystals. Snowfall can probably be affected in the desired manner. However, there is a strong dependence on the cloud top temperature, which indicates that snowfall can be initiated, redistributed, or not be affected at all. No objective analysis of the seeding effect can be devised due to the great difficulties in accurately measuring the rate of snowfall. Unless the seeding efficiency of the generator used produces enough nuclei at the location in the cloud system where nuclei are needed, the effect is most likely irrelevant or lost in the background. Through application of comparative snow-crystal analysis, the plausibility that the Great Lakes winter storms belong to a more general category of shallow winter storms for which boundary layer flow constitutes an important origin was examined. This storm type occurs frequently not only in large-scale orogenic precipitation but also in large-scale cyclonic warm-front type snowstorms. (Knapp-USGS)
W74-05732

BOOM IN THE U.S. DESERT--CAN IT KEEP ROLLING.
U.S. News and World Report, Vol 75, p 51-56, September 17, 1973. 1 tab, 12 photo.

Descriptors: *Arizona, *Arid lands, *Reservoir operation, *Water conveyance, *Water distribution(Applied), Water shortage, Desalination plants, Forecasting, Pipelines, Aquifers, Irrigation systems, Aqueducts, Damsites, Hydroelectric plants, National monuments, Semiarid climates, Water supply development, Water resources development, Pumping, Water storage, Dams, Water utilization.
Identifiers: *Energy crisis.

The boom in the Southwest United States is discussed, and whether water and energy supplies will be available to enable the growth to continue. To date, attempted solutions to water supply problems have been long pipelines, reservoirs, and aqueducts. Problems are arising due to the energy crisis, since electricity is essential for pumping and there are no more major dam sites available for hydroelectric power. Phoenix obtains its water from a 70 year old irrigation project. Homes, offices, factories, and shopping centers have simply moved into the irrigated fields, taking over the water rights. These activities will probably cause food prices to rise. Presently under construction and due for completion in 1980 is an aqueduct from the Colorado River. One recent conflict between growth and the environment arose over Glen Canyon Dam. It provides peaking power to Southwest cities but the filling of Lake Powell behind the dam for storage of water would flood Rainbow Bridge National Monument. Problems such as this are everpresent, but they are recognized, and plans are being formulated to overcome them. (Sperling-Florida)
W74-05792

AUGMENTING WATER SUPPLIES OF THE VOLGA RIVER AND DIVERTING PART OF THE RUNOFF OF NORTHERN RIVERS SOUTHWARD (O POVYSHENII VODOOBESPECHENNOSTI R. VOLGI I PEREBROSKE CHASTI STOKA SEVERNYKH REK NA YUG),
I. A. Gerardi.
Gidrotekhnika i Melioratsiya, No 11, p 112-117, November 1973. 1 fig, 1 tab.

Descriptors: *Streamflow, *Flow augmentation, *Diversion, *Alteration of flow, *Water management(Applied), Water utilization, Water resources, Water resources development, Planning.
Identifiers: *USSR(Volga River).

In all important economic regions of the RSFSR, the Ukraine, republic of Soviet Central Asia, the Transcaucasus, Kazakhstan, and even Belorussia, the scale and tempo of development of productive resources in the next 20-30 years will depend, to a great extent, on measures to increase natural water resources. Annual renewable streamflow in these regions (including the Volga, Dnieper, Kuban' and Terek Rivers) is about 480 cu km or 10.5% of total streamflow in the USSR. In relatively dry (75% probability) and dry (95% probability) years, total streamflow in the European south of the USSR decreases to 417 cu km and 346 cu km, respectively. Normal supply of water to all branches of the national economy in river basins of southern European Russia can be achieved only through diversion of flow from other river basins. In European Russia there is an acute need for a single water management system of regulation and interbasin redistribution of flow, based on water resources of the Volga and on diversion of part of the flow of northern rivers into it. The main contributors to this system should be the northern rivers and lakes of northwest European Russia. Two plans are envisaged for diverting northern waters to the south: (1) the western plan which provides for transfer of part of the flow of northern rivers into upper reaches of the Volga River and into the Rybinsk Reservoir; and (2) the eastern plan, whereby water is redirected into upper reaches of the Kama River. (Josefson-USGS)
W74-05836

PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART I. NORTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 6D.
W74-05858

3C. Use Of Water Of Impaired Quality

DETECTING SALINE SOILS IN THE RED RIVER VALLEY, MINNESOTA, BY REMOTE SENSING TECHNIQUES,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 7B.
W74-05519

HIGHLY MINERALIZED GROUNDWATER AND ITS UTILIZATION (PODZEMNYYE VODY POVYSHENNOY MINERALIZATSII I IKH ISPOL'ZOVANIYE),
For primary bibliographic entry see Field 3A.
W74-05565

ON THE NECESSARY AND SUFFICIENT CONDITIONS FOR A LONG-TERM IRRIGATED AGRICULTURE,
Economic Research Service, Davis, Calif. Farm Production Economics Div.
For primary bibliographic entry see Field 5B.
W74-05663

SEWAGE: THE SURPRISING RESOURCE,
California Attorney General's Environmental Task Force, Sacramento.
For primary bibliographic entry see Field 5D.
W74-05794

TECHNOLOGICAL MODIFICATION OF THE SEEDLING METHOD AND ANALYSIS OF ITS USEFULNESS FOR EVALUATION OF SALT TOLERANCE IN PLANTS,
Y. M. Ivanov, and G. V. Udovenko.

Available from the National Technical Information Service as TT-72-51131 $3.25 in paper copy, $1.45 in microfiche. Translation, TT-72-51131, 1973, 22 p, 2 tab, 31 ref. Trans. from Russian.

Descriptors: *Salt tolerance, *Resistance, *Seeds, *Germination, *Salinity, Saline soils, Salts, Metabolism, Reproduction, Plant growth, Viability, Plant physiology, Stress, Plant growth, Crop response, Growth rates, Plant growth regulators, Soil-water-plant relationships. Saline water, *Reviews.

A literature review is presented of the seedling method of salt tolerance in plants. This method involves the germination of seeds in a saline solution since the study of germination under field salinity conditions is impossible. The salt tolerance of the variety may thus be determined in light of specific environmental constraints placed upon the seedling. Several variations of the method include growth media, salinities, temperature, light, and nutrient considerations. Emphasis is placed on recent developments and modifications in the seedling method which has appeared in Russian literature. (Muller-Arizona)
W74-05920

3D. Conservation In Domestic and Municipal Use

EVAPORATION, INFILTRATION AND RAINFALL-RUNOFF PROCESSES IN URBAN WATERSHEDS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 2A.
W74-05405

INVESTIGATION OF POROUS PAVEMENTS FOR URBAN RUNOFF CONTROL,
Franklin Inst. Research Labs., Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W74-05411

CONSTRUCTION OF WASTEWATER FACILITIES, LUFKIN, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Federal Highway Administration, Austin, Tex.
For primary bibliographic entry see Field 5D.
W74-05814

MASTER PLANNING METHODOLOGY FOR URBAN DRAINAGE,
Rice (Leonard) Consulting Water Engineers, Denver, Colo.
For primary bibliographic entry see Field 6A.
W74-05834

WATER AND SEWER NEEDS OF LOW INCOME FAMILIES FOR THE MID-CUMBERLAND REGION OF TENNESSEE.
Mid-Cumberland Council of Government, Nashville, Tenn.
For primary bibliographic entry see Field 5D.
W74-05870

SHAWNEE COMPREHENSIVE PLAN, WATER WORKS SYSTEM AND SANITARY SEWERAGE SYSTEM,
Benham-Blair and Affiliates, Inc., Oklahoma City.
For primary bibliographic entry see Field 5D.
W74-05871

REGIONAL WATER AND SEWER CAPITAL IMPROVEMENTS PROGRAM.
Northwest Missouri Regional Planning Commission, Maryville.
For primary bibliographic entry see Field 5D.
W74-05874

MANAGEMENT OF STORM DRAINAGE AND FLOOD CONTROL ACTIVITIES.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 5D.
W74-05878

PLANNING MANUAL FOR STORM DRAINAGE AND FLOOD CONTROL.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 5D.
W74-05879

FEASIBILITY OF COMBINED SOLID WASTE AND STORM DRAINAGE PROJECTS.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 4A.
W74-05880

3E. Conservation In Industry

STAFF REPORT ON COAL GASIFICATION: PROCESSES AND EFFECTS,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5B.
W74-05416

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF R. E. GINNA NUCLEAR POWER PLANT UNIT I, ROCHESTER GAS AND ELECTRIC CORPORATION.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-05422

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED CATAWBA NUCLEAR STATION, UNITS 1 AND 2, DUKE POWER COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-05423

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF SAN ONOFRE NUCLEAR GENERATING STATION UNIT 1, SOUTHERN CALIFORNAI EDISON COMPANY AND THE SAN DIEGO GAS AND ELECTRIC COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-05424

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED LIMERICK GENERATING STATION, UNITS 1 AND 2, PHILADELPHIA ELECTRIC COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-05425

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3, COMMONWEALTH EDISON COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-05426

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE HADDAM NECK (CONNECTICUT YANKEE) NUCLEAR POWER PLANT, CONNECTICUT YANKEE ATOMIC POWER COMPANY.
Directorate of Licensing (AEC), Washington D.C.
For primary bibliographic entry see Field 5C.
W74-05427

FINAL ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION OF GRAND GULF NUCLEAR STATION UNITS 1 AND 2, MISSISSIPPI POWER AND LIGHT COMPANY.
Directorate of Licensing (AEC), Washington D.C.
For primary bibliographic entry see Field 5C.
W74-05428

WATER FOR INDUSTRIAL DEVELOPMENT IN CALHOUN, CHICKASAW, CHOCTAW GRENADA, MONTGOMERY, WEBSTER, AND YALOBUSHA COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
R. Newcome, Jr., J. M. Bettandorff, and D. E. Shattles.
Mississippi Research and Development Center Publication, 1973. 64 p, 31 fig, 13 tab, 24 ref.

Descriptors: *Water supply, *Industrial water *Mississippi, Surface waters, Groundwater Hydrologic data, Data collections, Water yield Streamflow, Transmissivity, *Water wells.

An investigation of the water resources of the area comprising Calhoun, Chickasaw, Choctaw Grenada, Montgomery, Webster, and Yalobusha Counties, in north-central Mississippi, was begun in April 1970 to gather and disseminate facts on the quality and quantity of the water available for industrial use. The area represents six of the State's physiographic provinces, four of its large river basins, and most of its freshwater-bearing geologic units. The area also contains two major flood-control reservoirs, Grenada and Enid Lakes. Present water use is 17 mgd, practically all obtained from wells. A much larger usage could be supported by the streams, lakes and aquifers. The largest streams are the Yalobusha, Big Black, and Skuna Rivers, and the long-term average runoff from the area is 0.8 mgd per sq mi. Sustained dry-weather flow ranges from 0 to 0.04 mgd per sq mi. The chemical quality of the surface water in the study area is suitable without treatment for most industrial purposes. The fresh-groundwater section is 500 to 2,500 feet thick and contains aquifers ranging in age from Cretaceous to Pleistocene. The principal aquifers are confined and many are capable of yielding moderate to large supplies to wells. Permeabilities of 100 to 500 gpd per sq ft are common; transmissibilities of 2,000 to 55,000 gpd per ft were determined from pumping tests. The most productive wells are in the Meridian-upper Wilcox aquifer and several are pumped at nearly 1,000 gpm. Groundwater in the Cretaceous aquifers is highly mineralized and commonly has high concentrations of fluoride. The Tertiary aquifers have softer, less mineralized water. High concentrations of iron are present in water from all the aquifers. Most of the groundwater is alkaline. Temperatures of water from shallow aquifers are about 20 deg C from the deepest aquifers about 4 deg C. (Knapp-USGS)
W74-05525

CONSERVATION OF WATER AND REDUCTION OF POLLUTION BY USE OF SOLVENT SYSTEMS FOR COLORING TEXTILE MATERIALS: AN ECONOMIC OUTLOOK,
Auburn Univ., Ala. Dept. of Textile Engineering.
D. M. Hall, and W. S. Perkins.
Available from the National Technical Information Service as PB-229 848; $4.25 in paper copy $1.45 in microfiche. Water Resources Research Institute, Auburn University, Bulletin 20, 1974. 19 p, 2 fig, 1 tab, 1 append. OWRR A-020-ALA(3).

scriptors: *Textiles, *Dyes, *Solvents, Water nservation, Economic feasibility, Costs, Pollu- n abatement, Water quality control.
entifiers: Perchloroethylene, Trichloroethylene, hlorinated solvents.

is economically feasible to use chlorinated sol- nts to replace water as the transfer vehicle in the eing of polyester fibers. The chlorinated solvent stem takes less time and can be recovered at a ction of the heat requirements needed for ter; however, other problems associated with : solvent system must be solved before such a stem will be accepted by the textile industry. 74-05535

BLIC WORKS FOR WATER AND POWER VELOPMENT AND ATOMIC ENERGY MMISSION APPROPRIATION BILL, 1974 RT 6.
r primary bibliographic entry see Field 6E. 74-05588

. Conservation In Agriculture

TROGEN UPTAKE EFFICIENCY BY FOUR ANT SPECIES IN THE FIELD AND OWTH CHAMBER,
rdue Univ., Lafayette, Ind. Water Resources search Center.
r primary bibliographic entry see Field 5B. 74-05404

CROCLIMATE MANAGEMENT BY TRADI- ONAL FARMERS,
lorado State Univ., Fort Collins.
C. Wilken.
ographical Review, Vol 62, No 4, p 544-560, 2.
ntifiers: *Climate management, *Ground er, Microclimates, Mulches, Tillage systems, getation, *Windbreaks, *Crops, Farm manage- nt.

xes of energy, heat and moisture that produce tinctive crop microclimates are controlled by face shade, albedo, conductivity and geometry. ditional farmers use vegetation, tillage tems, mulches, and man-made structures to dify surface characteristics and thus the roclimates. Windbreaks and groundcovers pro- t plants from the mechanical forces of wind and or hail and inhibit dispersal of natural or dified microclimates. Although descriptive dence of climate management by traditional ners is abundant, quantitative data to evaluate effectiveness and the extent of particular prac- s are scarce. Nevertheless, climate should be ed to the list of environmental factors over ch traditional farmers exercise significant con- --Copyright 1973, Biological Abstracts, Inc. 4-05452

PLICATIONS OF AERIAL PHOTOGRAPHY D ERTS DATA TO AGRICULTURAL, REST AND WATER RESOURCES MANAGE- NT.
nesota Univ., St. Paul. Inst. of Agriculture note Sensing Lab.
primary bibliographic entry see Field 7B. 4-05515

RN DEFOLIATION SURVEYS,
nesota Univ., St. Paul. Inst. of Agriculture note Sensing Lab.
primary bibliographic entry see Field 7B. 4-05520

ALFA CROP PRODUCTIVITY ANALYSIS,
nesota Univ., St. Paul. Inst. of Agriculture note Sensing Lab.
primary bibliographic entry see Field 7B.

W74-05521

DEVELOPMENT OF PREDICTION RELATIONSHIPS FOR WATER REQUIREMENTS WITH IRRIGATION COOLING,
Kentucky Water Resources Inst., Lexington.
B. J. Barfield, J. N. Walker, and F. A. Payne.
Available from the National Technical Information Service as PB-229 791; $3.25 in paper copy, $1.45 in microfiche. Research Report No. 70, 1974. 49 p, 13 fig, 2 tab, 1 graph, 29 ref, 2 append. OWRR A-028-KY(1). 14-31-0001-3217 and 14-31-0001-3517.

Descriptors: Irrigation, *Evapotranspiration, *Energy budget, Leaves, Temperature, Model studies, Mist irrigation, *Forecasting, Cooling, Sorghum, *Water requirements.
Identifiers: Plant temperatures, Energy balance, *Leaf temperatures, Arizona sorghum.

A model for predicting leaf temperatures during an off-on mist cycle is presented. The model uses a combination of energy budget and aerodynamic techniques. The model was tested for dry leaf temperature and evapotranspiration predictions using average hourly data from Arizona. The accuracy was good. It was also tested for dry leaf temperature predictions using two to three minute data with a widely varying net radiation. When reasonable values of stomatal resistance were used, the agreement was again good. The model was tested for prediction of wet leaf temperature with a ten minute on, fifty minute off mist irrigation cycle. The agreement was fair when using reasonable input parameters. The poorest predictions were during the mist on cycle. (Grieves-Kentucky)
W74-05539

PRIMER ON AGRICULTURAL POLLUTION,
For primary bibliographic entry see Field 5B.
W74-05569

WATER-USE EFFICIENCY AND ITS RELATION TO CROP CANOPY AREA, STOMATAL REGULATION AND ROOT DISTRIBUTION,
Kansas Agricultural Experiment Station, Manhattan, Evapotranspiration Lab.
I. D. Teare, E. T. Kanemasu, W. L. Powers, and H. S. Jacobs.
Agron J. Vol 65, No 2, p 207-211. 1973. Illus.
Identifiers: *Crop canopy, Distribution, *Evapotranspiration, Glycine-Max, *Root system, *Sorghum, *Stomatal, Transipiration, *Soybeans, Water utilization.

The differences in water-use efficiency between sorghum (Sorghum bicolor (L.) Moench) and soybean (Glycine max (L.) Merrill) were compared in terms of leaf area index (LAI), size of root system, canopy stomatal resistance (Rc), net assimilation rate (NAR), and evapotranspiration (ET). The field water budget was measured by recording the rainfall and irrigation water applied in relation to the ET as measured with 2 weighing lysimeters. The evapotranspiration rates of the 2 crops began to diverage about Aug. 15. This was the period when the soybean canopy began to close and the soybean LAI increased to about 1.5 times that of sorghum. NAR for sorghum during stalk elongation and heading (Aug. 15) was nearly 4 times that of soybeans during that time. Divergence of the 2 evapotranspiration curves coincided with observed differences in canopy stomatal resistance. In Aug. after a stress period, the Rc for sorghum at 1 and 3 pm was nearly 3 times the Rc for soybeans. The increase in Rc for sorghum was concomitant with an air temperature increase of 3C above the air temperature near soybeans. Sorghum had approximately twice the weight of roots per volume of soil as soybeans. Even though atmospheric demand for water was similar for the 2 crops, sorghum was able to close its stomata more than soybeans, and thus conserve soil water even with a larger root system and more water in the soil profile rsulting from reduced evapotranspiration. Water-use efficiency of sorghum (g DM/kg H2O) was approximately 3 times that of soybeans on dry matter or grain yield bases.--Copyright 1973, Biological Abstracts, Inc.
W74-05621

SOME EVIDENCE OF STOMATAL RESTRICTION OF EVAPORATION FROM WELL-WATERED PLANT CANOPIES,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 2D.
W74-05662

WATER-YIELD RELATIONS FOR NON-FORAGE CROPS,
New South Wales Dept. of Agriculture, Leeton (Australia). Agricultural Research Station.
L. A. Downey.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR1, p 107-115, March, 1972. 3 fig, 13 ref.

Descriptors: *Irrigation practices, *Water distribution(Applied), *Water demand, *Water requirements, *Irrigation efficiency, Irrigation engineering, Soil moisture, Cost-benefit ratios, *Evapotranspiration, Grains(Crops), Irrigation, Water balance, Consumptive use.
Identifiers: Water deprivation, Agricultural products.

The relationship between soil moisture stress, evapotranspiration, and marketable yield of crops - where the yield is a reproductive organ or associated product - is examined. Under conditions of constant stress, yield is reduced as a linear function of stress. Where stress is applied at different stages in the development of the crop, no simple reltionship exists. To predict yield from the water available or from evapotranspiration, the severity of stress and the physiological stage of development must be defined. A disproportionate reduction in yield is induced by water stress during the phases of reproduction corresponding to the period of peak evapotranspiration. Therefore, if irrigation engineers cannot plan their systems for times of peak demand, cost-benefit analyses should reflect probable yield reductions. (Skogerboe-Colorado State)
W74-05665

MOVEMENT OF NITRATES UNDER IRRIGATED AGRICULTURE,
Nebraska Univ., Lincoln. Coll. of Engineering and Architecture.
For primary bibliographic entry see Field 5B.
W74-05666

WATER REQUIREMENTS OF ROSTERED IRRIGATION SCHEMES,
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.
P. D. Fitzgerald, and G. C. Arnold.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR1, p 91-96, March, 1972. 1 fig, 3 tab, 4 ref.

Descriptors: *Irrigation practices, *Irrigation systems, Water distribution(Applied), *Computer models, Distribution systems, Water delivery, Water demand, Irrigation engineering, Irrigation efficiency, Surface irrigation, Irrigation, Water allocation(Policy), Water requirements, Soil moisture, *Rotations.
Identifiers: *New Zealand, Irrigation scheduling.

A method is given whereby the water requirements of a rostered (rotation) irrigation scheme can be determined by considering the length of the roster period and the calculated soil moisture deficit at which irrigation is applied. From this the

storage likely to be needed can be calculated. The method is computer processed so variations can easily be studies. An example of its application to the Irrigation Schemes of Mid-Canterbury, New Zealand, is given. (Skogerboe-Colorado State)
W74-05667

SELF-CLOSING IRRIGATION PIPE VALVE,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 8B.
W74-05670

SUBSURFACE DISTRIBUTION OF NONUNIFORMLY APPLIED SURFACE WATERS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
W. E. Hart.
Transaction of the ASAE (American Society of Agricultural Engineers), Vol 15, No 4, p 656-661, July-August, 1972. 14 fig, 1 tab, 13 ref.

Descriptors: *Irrigation practices, *Irrigation design, *Sprinkler irrigation, *Irrigation systems, Uniformity coefficient, Computer models, Application methods, Application equipment, Sprinkling, Crop production.

Sprinkler irrigation systems are evaluated by determining the uniformity of water as it is applied to the surface of the ground. The plant responds to the distribution of the water as it occurs within the soil. The gradients existing within the unevenly wetted soil move moisture laterally (and vertically) within the profile, causing the water within the soil to be more uniformly distributed than indicated by the initial, surface-measured distribution. The extent of this movement throughout the soil, within a reasonable length of time, appears to be a function of the following variables: initial moisture content, average application rate, distribution of water as applied to the surface, length modulus, soil type, and total applied water. Current methods of designing irrigation systems, which are based almost exclusively on anticipated initial uniformity, are inadequate if the aim of the design is to provide the most economical system possible. (Skogerboe-Colorado State)
W74-05671

IRRIGATION IN ANCIENT MESOPOTAMIA,
Illinois Univ., Urbana. World Heritage Museum.
For primary bibliographic entry see Field 4A.
W74-05673

VOLUME BALANCE METHOD FOR COMPUTING INFILTRATION RATES IN SURFACE IRRIGATION,
Orissa Univ. of Agriculture and Technology, Bhubaneswar (India).
R. Lal, and A. C. Pandya.
Transactions of the ASAE (American Society of Agriculture Engineers), Vol 15, No 1, p 69-72, January-February, 1972. 4 fig, 2 tab, 7 ref.

Descriptors: *Irrigation practices, *Irrigation efficiency, Infiltration, *Surface irrigation, Irrigation design, *Infiltration rates, Unsaturated flow, Irrigation, Irrigation engineering.

Based upon the equation of continuity an empirical infiltration equation can be developed from the water measurements during surface irrigation. This so called volume balance method of calculating infiltration rate from surface irrigation data is most practical as it presents the actual mean conditions that exist during irrigation application. For high degree of accuracy, small time increment may be taken and calculations involved can be conveniently done by using computer techniques. An example of computation based upon field data collected at the Indian Institute of Technology, Kharagpur, India, is presented to show how the method is used. Copies of the computer program are available on request from the authors. (Skogerboe-Colorado State)
W74-05674

SOIL STORAGE LIMITATIONS ON EFFLUENT IRRIGATION,
Missouri Univ., Columbia. Dept. of Forestry.
For primary bibliographic entry see Field 5D.
W74-05676

ESTIMATION PROCEDURES FOR RESPONSE FUNCTIONS OF CROPS TO SOIL WATER CONTENT AND SALINITY,
Hebrew Univ., Jerusalem (Israel). Dept. of Agricultural Economics.
D. Yaron, H. Bielorai, J. Shalhevet, and Y. Gavish.
Water Resources Research, Vol 8, No 2, p 291-300, April, 1972. 6 tab, 4 fig, 21 ref.

Descriptors: *Salinity, *Irrigation practices, *Crop response, *Soil-water-plant relationships, Soil moisture, Soil chemistry, Crop production, Soil environment, Soil management, Agricultural engineering, *Soil water, Estimating.

The specification and estimation procedures of the response functions of crops to soil water content and salinity are presented. The conceptual framework is discussed, and the application of the suggested procedures is illustrated by an analysis of two irrigation experiments. The possibility of positive correlations between soil salinity, soil water content, and crop yield is discussed, and possible erroneous evaluations of the effect of salinity on crop yield in such situations are pointed out. (Skogerboe-Colorado State)
W74-05678

RECESSION FLOW IN SURFACE IRRIGATION,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W74-05679

SHAPE FACTORS IN IRRIGATION WATER ADVANCE EQUATION,
Uttar Pradesh Agricultural Univ., Naini Tal (India). Dept. of Agricultural Engineering.
P. Singh, and H. S. Chauhan.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR3, p 443-458, September, 1972. 10 fig, 1 tab, 9 ref.

Descriptors: *Irrigation practices, *Irrigation design, Hydraulics, *Surface irrigation, Flow, Irrigation engineering, *Infiltration rates, Soil mechanics, Soil physics, Irrigation.

Utilizing empirical advance and infiltration functions, relationships for surface and subsurface storage shape factors have been obtained. The surface and subsurface shape factors as expressed by these relationships are functions of time and infiltration characteristics of soil. Incorporating these relationships, a continuity equation has been written for advance in surface irrigation. The equation for advance of water compares well with field data and relationships of other workers. (Skogerboe-Colorado State)
W74-05681

ELEMENTAL COMPOSITION AND RESPONSE TO NITROGEN OF SUNFLOWER AND CORN,
Minnesota Univ., St. Paul. Dept. of Agronomy and Plant Genetics.
R. G. Robinson.
Agron J. Vol 65, No 2, 318-320, 1973.
Identifiers: *Corn(Field), Depletion, Irrigation, *Nitrogen, Nutrients, Soils, *Sunflower, *Fertilizers, Crop yield.

Comparison was made between sunflower (Helianthus annuus L.) and corn (Zea mays L.) yield, elemental composition, response to N fertilizer and removal of nutrients from the soil. The crops were grown on silt loam soil with and without N applied at various times and on sandy soil with and without N and irrigation. N at 75 to 150 kg/ha failed to significantly increase yield of either crop on fertile silt loam soils. On drought sand, N at 224 kg/ha increased sunflower yield but both irrigation and N were needed to significantly increase corn yield. Treatments within a trial did not affect elemental composition except where treatment altered yield. Sunflower achenes and vegetative parts had greater concentration of most elements than did corn. However, the higher yield of corn offset this and resulted in greater depletion of most elements. Concentrations are given of N, P, K, S, Ca, Mg, Na, Sr, Al, Fe, Mn, Cu, Mo, Mn, and B in corn and sunflower stover and leaves in prebloom stage and in mature sunflower achenes, sunflower stover, corn caryopses, and corn stover. Sunflower yields were 35-40% those of corn under favorable soil fertility and moisture conditions. Sunflower ranks below corn as a soil-depletive crop.--Copyright 1973, Biological Abstracts, Inc.
W74-05703

AQUACULTURE: PROBLEMS WITH THE PROMISE,
H. Pennington.
Oceans, Vol 5, No 1, p 43-49, January-February 1972. 6 photo.

Descriptors: *Fish farming, Aquatic productivity, *Farm ponds, *Fish harvest, Fish populations, Fish hatcheries, Fish stocking, Pounds fish per acre, Fish reproduction, Food habitats, Fish management, Growth stages, Economic aspects, Commercial fishing, *Aquiculture, Oceans, Coasts, Fisheries, Foods, Aquatic animals, Fish, Shellfish, Farming.
Identifiers: *Coastal waters, *Prawns.

Fish farming is one potential food source for the future. Some forms of seafood cultivation have been practiced since 475 B.C. Genetic control of aquatic creatures is important to produce fast growing animals on lesser amounts of food. First, the goal of aquaculturists is to raise fish from one generation to the next under controlled conditions. The few ventures in commercial aquaculture in the United States have concentrated on high priced luxury seafood items, grown from larvae captured in the wild. From 1954 to 1968 the ocean's fish yield tripled, but in 1969 the catch was over a million tons less than in 1968 even though there were more fishing vessels. Despite the fact that fish farming has been practised for centuries very little research has been carried out. If the ocean is to provide a new food source for the future, its yield must be increased by aquaculture. Research is needed with regard to particular species in order to determine the maximum yields. (Sperling-Flora)
W74-05802

COMPLEX USE OF VOLGA WATER RESOURCES (KOMPLEKSNOE ISPOL'ZOVANIYE VODNYKH RESURSOV VOLGI),
I. N. Lisitsyna, and V. L. Ronin.
Gidrotekhnika i Melioratsiya, No 11, p 109-12, November 1973. 1 fig.

Descriptors: Water resources, *Water utilization, *Water control, *Irrigation systems, *Irrigation programs, Agriculture, Water conservation, Water pollution control.
Identifiers: *USSR(Volga River).

Average long-term runoff of the Volga River is more than half of all the water resources of river basins in the European south of the USSR. Principal water users in the Volga River basin are agriculture, the fishery economy, hydroelectric

wer, navigation, and industry. A total of 96 ir-ation and flood-irrigation systems have already en constructed or are scheduled for construc-n in the Volga River region. Water conservation easures deemed essential to the Volga basin in-ude: (1) industrial water recycling; (2) improve-nt in production technology and introduction of tional industrial processes; and (3) maximum rtailment of discharges of both treated and un-eated sewage into rivers and water bodies. The SU Central Committee and USSR Council of inisters in a 1972 decree 'On Measures to event Pollution of the Volga and Ural River sins With Untreated Sewage' have formulated easures aimed at complete treatment of sewage the basin by 1980. Continued growth of all anches of the national economy in the basin will sult in large irretrievable withdrawals of runoff. 1985, water consumption in the basin may ch 42 cu km/yr, and lead to changes in the ter balance of the Caspian Sea and to a decline sea level. Measures are outlined for stabilizing level of the sea and for preserving the rthern Caspian as a highly productive water dy. (Josefson-USGS)
74-05837

FLUENCE OF HYDROGEN FLUORIDE FU-GATION ON THE WATER ECONOMY OF YBEAN PLANTS,
rdue Univ., Lafayette, Ind. Dept. of Horticul-e.
W. Poovaiah, and H. H. Wiebe.
nt Physiol. Vol 51, No 2, p 396-399. 1973. Illus.
ntifiers: *Fluorides, *Fumigation, Glycine-x, Hydrogen fluoride, Necrosis, *Soybean, ranspiration, Stomatal closure, Water potential.

e influence of hydrogen fluoride fumigation on ter economy was studied using soybean ycine max (L.) Merr.). Fumigation caused par-stomatal closure in 1 hr and practically nplete closure within 4 hr. The transpiration e was greatly reduced by fumigation, while the f temperature was increased. Water potential reased after 1 day but fell drastically when rosis occurred. Efflects of interrupted fumiga-n during the day were somewhat less severe in respects than those of continuous fumigation; httime fumigation caused only minor effects. oride uptake was also much less from nighttime n from daytime fumigations.--Copyright 1973, logical Abstracts, Inc.
4-05838

E EVALUATION ACCORDING TO SOIL ISTURE CONTENT AND ECESSARY IM-OVEMENT PRACTICES IN THE USSR,
in Geophysical Observatory, Leningrad SR).
primary bibliographic entry see Field 2G.
4-05841

TMEATION OF UNCHARGED ORGANIC LECULES AND WATER THROUGH TO-TO ROOTS,
artment of Agriculture, South Perth stralia).
N. Perry, and H. Greenway.
Bot (Lond). Vol 37, No 149, p 225-232. 1973,
ntifiers: Membranes, *Organic molecules, rmeation, *Root systems, *Tomato roots, m, Glycols, Glucose, Raffinose.

neation of ethylene glycol, D-mannitol, L-glu-, and raffinose through excised tomato roots investigated. Solute transport from external tion to the xylem sap was determined at vari-rates of exudate flow achieved in turn by ap-ation of different pressures to the solution sur-ding the roots. At an applied pressure of 2 bar, dy-state solute concentrations expressed as a entage of external concentrations were, 52% ethylene glycol, 3-4% for mannitol and glu-cose, and 1% for raffinose. Such relationships between the chemical structure of the solute and its concentration in the xylem sap are similar to those demonstrated by other workers for solute permeation into single cells. Thus in the present experiments most of these solutes presumably flowed through at least one membrane before reaching the xylem. The data also indicate that the flow of water via wholly extracellular pathways was slight, at most, 1% of the total flow reaching the xylem via this route.--Copyright 1973, Biological Abstracts, Inc.
W74-05852

AN ECONOMIC ANALYSIS OF ALTERNATIVE SPRINKLER IRRIGATION DISTRIBUTION SYSTEMS ON THE SOUTHERN HIGH PLAINS OF TEXAS,
Texas A and M Univ., College Station. Dept. of Agricultural Economics and Rural Sociology.
R. D. Lacewell, and J. C. Pearce.
Resource Development Workgroup, Departmental Technical Report 73-4. September 1973. 91 p, 5 fig, 12 tab, 29 ref, 5 append.

Descriptors: *Irrigation systems, *Sprinkler irrigation, *Economic feasibility, Irrigation water, Pumping, Model, Recharge, *Texas, Water distribution(Applied).
Identifiers: *Ogallala Formation(Tex), Southern High Plains(Tex).

A model is presented for evaluating sprinkler irrigation distribution systems relative to their effect on the economic life and value of an exhaustible irrigation water supply. The model traces the beginning water resource situation and sequentially allocates irrigation water annually until economic exhaustion of irrigation water occurs. The area of study was the Ogallala Formation in the Southern High Plains of Texas which was determined to be an exhaustible aquifer because of a small annual recharge in comparison with the quantity of water pumped annually for irrigation use. Alternative systems investigated included the hand-move, side-roll, and pivot irrigation distribution systems. (Mastic-Arizona)
W74-05924

IRRIGATION SYSTEM,
R. P. Hammond, and J. W. Michel.
Available from the National Technical Information Service as PAT APPL-228 676(70), $3.00 in paper copy, $1.45 in microfiche. Atomic Energy Commission Patent Application Serial Number 228, 676(70), February 1972. 8 p, 3 fig.

Descriptors: *Patents, *Irrigation systems, *Subsurface irrigation, Arable land, Irrigation design, Irrigation efficiency, Irrigation systems, *Irrigation engineering, Pipes, Water distribution(Applied), Design.
Identifiers: *Trickle Irrigation.

Subsurface and trickle irrigation techniques have received attention in recent years as potential methods for increasing irrigation efficiency in the agriculture of arid lands. A spring mechanism is used on slits in plastic distribution pipe to control the size of the aperture at operating water pressures. Such a spring assures the opening of the slit at a given pressure and also increases the closing pressure. A detailed description of the system is presented as are several preferred embodiments. The system tends to make all the slits operate simultaneously in response to pressure pulses, which also clean the slits of debris. The length of pipe in each system may be increased due to the higher operating pressure, and gaseous fertilization may be introduced through the system. The system is economical in that it may be installed mechanically at low cost and it employs a smaller amount of irrigation water than other methods. (Muller-Arizona)
W74-05928

THE INFLUENCE OF DROUGHT ON THE GROWTH, YIELD AND COMPOSITION OF THE FIELD BEAN, (IN FRENCH),
Institut National de la Recherche Agronomique, Dijon (France).
S. Meriaux.
Ann Agron (Paris). Vol 23 No 5, p 533-546. 1972. Illus. English summary.
Identifiers: *Bean, *Drought, *Growth(Beans), Photosynthesis, Transpiration, *Crop yield, Crop production.

The plant shows a high rate of growth during pod formation. Drought does not affect the biochemical composition of the plant, apart from transient accumulative phenomena in a number of simple synthesis compounds. The yield of seeds and net photosynthesis are closely associated with transpiration. Seed yield depends on the duration of drought especially during the fruiting stage.--Copyright 1973, Biological Abstracts, Inc.
W74-05941

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, FOURTH VOLUME.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 6A.
W74-05401

DETERMINATION OF DISCHARGE-FREQUENCY RELATIONSHIPS UTILIZING NON-LINEAR HYDROGRAPHS AND A MODIFIED RATIONAL FORMULA,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 2A.
W74-05406

AN ANALYTICAL INTERDISCIPLINARY EVALUATION OF THE UTILIZATION OF THE WATER RESOURCES OF THE RIO GRANDE IN NEW MEXICO: MIDDLE RIO GRANDE REGION,
New Mexico State Univ., University Park. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W74-05408

RESERVOIR STORAGE AND THE THERMAL REGIME OF RIVERS, WITH SPECIAL REFERENCE TO THE RIVER LUNE, YORKSHIRE,
Durham Univ. (England).
M. E. Lavis, and K. Smith.
Sci Total Environ. Vol 1, No 1, p 81-90. 1972. Illus.
Identifiers: *Reservoir storage, Rivers, *Thermal regime, *United Kingdom(River Lune), Yorkshire, *Water temperature, Reservoir construction.

The effect of reservoir construction on downstream water temperatures was studied. Following an outline of the general mechanisms involved in such thermal modifications, a case study of the Yorshire Lune (United Kingdom) employing field observations collected over a 2 yr period is described. Emphasis is placed on the extent to which the natural range of stream water temperature variation is suppressed by the 2 direct-supply reservoirs on this river.--Copyright 1973, Biological Abstracts, Inc.
W74-05464

APPLICATIONS OF AERIAL PHOTOGRAPHY AND ERTS DATA TO AGRICULTURAL, FOREST AND WATER RESOURCES MANAGEMENT.
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 7B.
W74-05515

FOREST DISEASE DETECTION AND CONTROL,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 7B.
W74-05516

EVALUATION OF PEATLAND WATER TABLE ELEVATION AND WATER QUALITY INDICATORS,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 7B.
W74-05517

FOREST VEGETATION CLASSIFICATION AND MANAGEMENT,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 7B.
W74-05518

NEW DIRECTIONS IN U.S. WATER POLICY--SUMMARY, CONCLUSIONS AND RECOMMENDATIONS FROM THE FINAL REPORT OF THE NATIONAL WATER COMMISSION.
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 6B.
W74-05522

WATER FOR INDUSTRIAL DEVELOPMENT IN CALHOUN, CHICKASAW, CHOCTAW, GRENADA, MONTGOMERY, WEBSTER, AND YALOBUSHA COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 3E.
W74-05525

GUIDELINES FOR DEALING WITH FLOODS ON HAY CREEK.
Army Engineer District, Philadepa.
January 1973. 8 p, 3 fig.

Descriptors: *Floods, *Flood protection, Flood control, *Pennsylvania, *Flood plain zoning, Flood plain insurance, Non-structural alternatives.
Identifiers: Hay Creek(Penn).

The Hay Creek Watershed drains 22.2 square miles in Berks County. From its source, the stream flows in a northerly direction through Birdsboro into the Schuylkill River. The Borough of Birdsboro, located along the downstream reach, is completely urbanized with commercial properties, transportation facilities, and private residences and has been subjected to frequent flooding. The flooding problem can be attributed to the following causes: insufficient in-bank capacity to contain the quantity of flow which accompanies heavy rainfall; inadequate capacity of bridges to pass the quantity of flow which accompanies heavy rainfall; and backup from high stages in the Schuylkill River. Despite the expenditure of tax funds running into billions of dollars for flood-control works, the increase in flood damages has led to a new approach for reducing these damages. This approach is the application of control over the use of land lying adjacent to the river through the planned development and management of flood-hazard areas. While flood-plain areas can probably never be considered floodfree, planning will allow selection of a flood risk according to the type of development desired. This will assure a reasonable level of protection during initial construction of a project. In addition, measures are given for reducing or preventing flood damages. (Knapp-USGS)
W74-05532

EXTENDED PERIOD SIMULATION OF WATER DISTRIBUTION NETWORKS,
Systems Control, Inc., Palo Alto, Calif.
H. S. Rao, D. W. Bree, Jr., and R. Benzvi.
Available from the National Technical Information Service as PB-230 148; $5.00r copy, $1.45 in microfiche. Final Report, February 1974. 150 p, 29 ref, 1 append. OWRR-C-4164(9027)(1).

Descriptors: *Simulation analysis, *Water distribution(Applied), *Control systems, *Computer programs, *Networks, Model studies, California, *Reservoir operation, Design data, Pumps, Valves, Storage, Municipal water.
Identifiers: *Extended period simulation, San Jose(Calif).

An extended period simulation procedure was developed for metropolitan water distribution networks. Efficient sparsity programming techniques were applied to obtain static network balances using a modified Newton-Raphson technique. An integration scheme was developed to link several static solutions each representing an interval of time. A program, called WATSIM, was developed and tested using field data provided by the San Jose Water Works, San Jose, California. Data included network data, switching data, parabolic characteristics of pumps, reservoir curves, and time varying demand patterns. Three cases were simulated: normal operation, emergency operation, and pump outage conditions. A 24-hour simulation of a 325 node, 450 line network was performed on UNIVAC 1108 computer and took 8.5 minutes of execution time and included approximately 100 static balances. An analysis was also performed to determine research needs for computer control of water distribution systems. It was concluded that the development of extended period simulation capability is an important step in providing tools for analysis and control of water networks.
W74-05533

AN EMPIRICAL MATHEMATICAL MODEL OF AN INTERCONNECTED WATERSHED SYSTEM,
Pennsylvania State Univ., University Park. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 2A.
W74-05543

RESERVOIRS, THEIR EFFECT ON NATURE AND THE ECONOMY, AND PRINCIPLES OF CONSTRUCTION (VODOKHRANILISHCHA, IKH VLIYANIYE NA PRIRODU I KHOZYAYSTVO, PRINTSIPY SOZDANIYA),
For primary bibliographic entry see Field 8A.
W74-05564

HIGHLY MINERALIZED GROUNDWATER AND ITS UTILIZATION (PODZEMNYYE VODY POVYSHENNOY MINERALIZATSII I IKH ISPOL'ZOVANIYE),
For primary bibliographic entry see Field 3A.
W74-05565

WATERSHED MODELS: TOOLS IN PLANNING LAND MANAGEMENT FOR WATER AND POLLUTION CONTROL,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2A.
W74-05570

FLOOD PROBLEMS IN CERTAIN AREAS OF THE HACKENSACK RIVER BASIN; SADDLE RIVER BASIN; PASSAIC RIVER BASIN; AN POMPTON RIVER BASIN--STATE OF NE JERSEY.
For primary bibliographic entry see Field 6E.
W74-05584

THE COLUMBIA RIVER TREATRY: TH ECONOMICS OF AN INTERNATIONAL RIVE BASIN DEVELOPMENT,
Resources for the Future, Inc., Washington, D.C
For primary bibliographic entry see Field 6E.
W74-05585

WATER RESOURCES DEVELOPMENTS AN NAVIGATIONAL IMPROVEMENTS ALASKA.
For primary bibliographic entry see Field 6E.
W74-05587

PUBLIC WORKS FOR WATER AND POWE DEVELOPMENT AND ATOMIC ENER COMMISSION APPROPRIATION BILL, 19 PART 6.
For primary bibliographic entry see Field 6E.
W74-05588

DELAWARE RIVER BASIN COMMISSION: A NUAL REPORT 1973.
Delaware River Basin Commission, Trenton, N.
For primary bibliographic entry see Field 6E.
W74-05589

A BILL AUTHORIZING THE CONSTRUCTIO REPAIR, AND PRESERVATION OF CERTA PUBLIC WORKS ON RIVERS AND HARBO FOR NAVIGATION, FLOOD CONTROL, A FOR OTHER PURPOSES.
For primary bibliographic entry see Field 6E.
W74-05592

EFFECT OF WATER-TABLE HEIGHT ROOT DEVELOPMENT OF PINUS CONTOR ON DEEP PEAT IN SCOTLAND,
Macaulay Inst. for Soil Research, Aberd (Scotland).
For primary bibliographic entry see Field 2I.
W74-05617

PARKLAND PLANNING AND LAKE MANA MENT IN THE ROCK RIVER BASIN.
Wisconsin Univ., Madison. Inst. for Environm tal Studies.
For primary bibliographic entry see Field 6B.
W74-05624

INTERNATIONAL MANAGEMENT OF TH RIO GRANDE BASIN - THE UNITED STA AND MEXICO,
University of Western Ontario, London. Dept Geology.
J. C. Day.
Water Resources Bulletin, Vol 8, No 5, p 935-
October, 1972. 3 fig, 18 ref.

Descriptors: *International waters, *Rio Gra River, *International Bound and Water Com *Water management(Applied), *United Sta *Mexico, Interstate rivers.
Identifiers: International water management.

Mexico and the United States forged a comm program to manage water and related land one Rio Grande. Actions of Rio Grande Commissa related to stream gaging, boundary definition, d multiple-purpose construction projects are amo the more successful international water-mane ment efforts in the world. Cost-sharing arra ments promoted rapid completing of internatial works. Joint action accomplished only part of expectations. International developments were co

petitive rather than complementary until basin water appropriation was virtually complete. Commissions were not employed to consider long-range competitive water needs, or regional water requirements, throughout the basin. International groundwater use coordination does not exist. International structures produce less than anticipated benefits. Hydroelectric generators are financial liabilities, irrigated acreage exceeds dependable streamflow, and soil salinization is experienced. Unanticipated environmental changes occurred in every major program. The Rio Grande experience points to the need for society to specify goals to which the use of water should contribute and specify priorities for water use among different sectors of river basins and various segments of society. (Skogerboe-Colorado State)
W74-05664

RRIGATION IN ANCIENT MESOPOTAMIA,
Illinois Univ., Urbana. World Heritage Museum.
S. T. Kang.
Water Resources Bulletin, Vol 8, No 3, p 619-624, June, 1972. 2 fig.

Descriptors: *Irrigation practices, *Salinity, Crop production, *History, *Silting, Irrigation systems.
Identifiers: *Iraq(Mesopotamia).

A translation of the cuneiform text written on clay tablets is presented. These writings are the day-by-day records of early irrigation activities. The problems of salinization and silting were very evident. The government of modern Iraq is using this information to locate and restore some of the irrigation systems. Decreased production, with time, is shown. These writings can be of benefit to modern man. (Skogerboe-Colorado State)
W74-05673

VOLUME BALANCE METHOD FOR COMPUTING INFILTRATION RATES IN SURFACE IRRIGATION,
Orissa Univ. of Agriculture and Technology, Bhubaneswar (India).
For primary bibliographic entry see Field 3F.
W74-05674

MEASUREMENT OF UNSATURATED HYDRAULIC CONDUCTIVITY BY THE CONSTANT OUTFLOW METHOD,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-05675

WATER TABLE AND SOIL MOISTURE PROBABILITIES WITH TILE DRAINAGE,
Clemson Univ., S.C. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-05677

RECESSION FLOW IN SURFACE IRRIGATION,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
T. Wu.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR1, p 77-90, March 1972. 6 fig, 1 tab, 9 ref.

Descriptors: *Surface irrigation, *Irrigation efficiency, *Surface runoff, *Recession curves, Furrow irrigation, Border irrigation, Irrigation systems, Irrigation engineering, Irrigation practices, Water storage, Flow.
Identifiers: *Recession flow.

The recession flow of furrow or border irrigation can be expressed as a simple power function which is derived by assuming a linear storage of recession flow. The flow length is expressed as a function of recession time and a constant. The knowledge of the length of recession flow profile and recession time is important in the evaluation of irrigation efficiency, especially in the border irrigation which has a relatively large volume of surface storage at the time when the inflow is shut off. Laboratory experiments were conducted and field data of sugarcane furrow experiments were applied to check the validity of the derived mathematical models. A simple recession flow equation is also derived by considering the recession flow as depleting water from a single shallow linear reservoir. For a relatively short length and small slope of furrow or border, the simple recession flow equation seems to be applicable. (Skogerboe-Colorado State)
W74-05679

THE VALUE OF THE TIDAL MARSH,
Georgia Univ., Athens. Inst. of Ecology.
For primary bibliographic entry see Field 2L.
W74-05782

BOOM IN THE U.S. DESERT--CAN IT KEEP ROLLING.
For primary bibliographic entry see Field 3B.
W74-05792

LITTLE RUNNING WATER DITCH WATERSHED PROTECTION, FLOOD PREVENTION, AND LAND DRAINAGE RC AND D MEASURE PLAN (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4D.
W74-05806

GATHRIGHT LAKE, JACKSON RIVER, JAMES RIVER BASIN, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
Available from National Technical Information Service, Springfield, Va, 22151, as EIS-VA-73-0178-F, $1.45 microfiche. January 19, 1973. 501 p, 14 map, 2 chart, 9 tab, 12 illus.

Descriptors: Environmental effects, *Reservoirs, Surface waters, *Dams, Flooding(Intentional inundation), Backwater, *Flood control, Reservoir fisheries, Recreation, Water pollution, Flood flow, Floodways, Spillways, Water control, Damsites, Dam construction, *Virginia.
Identifiers: *Environmental Impact Statements, *Gathright Lake(Va).

The project is a complete construction of a multipurpose reservoir on the Jackson River, James River Basin, Virginia. A dam will provide a combination flood control, water quality control, area redevelopment, and recreation project within Bath and Allegheny Counties. A cold-water trout habitat will be created in the Jackson River, and a permanent warm-water fishery in the reservoir. About 2,530 acres of land will be permanently inundated removing from effective production all agricultural lands within the Gathright Wildlife Management Area. Approximately 400 people have been relocated. About 12 miles of the Jackson River will be foregone for such things as fishing, canoeing, etc. Wildlife habitats beneficial to turkey and deer production will be reduced. Twenty alternatives were considered. Among them were alternative dam sites, a system of small dams, flood plain zoning, flood insurance, purchase of flood plain, lagooning of pollution wastes, complete removal of pollutants and abandonment of the Gathright project. (Conko-Florida)
W74-05808

BIRCH LAKE, BIRCH CREEK, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
Available from National Technical Information Service, Springfield, Va, 22151, as EIS-OK-72-5319-F, $1.45 microfiche. September 1972. 183, 12 map, 48 tab, 27 chart.

Descriptors: *Environmental effects, *Dams, Surface waters, *Reservoirs, Flooding(Intentional inundation), Dam construction, Fisheries, Water control, Backwater, Water supply, Water storage, Water transfer, *Flood control, Water utilization, Recreation facilities, Wildlife habitats, *Oklahoma.
Identifiers: *Environmental Impact Statements, *Birch Lake(Okla).

This project is located on Birch Creek in Osage County about two miles south of Barnsdall, Oklahoma. It includes the construction of a dam and reservoir for purposes of flood control, water supply, water quality control, recreation, and fish and wildlife habitat preservation. The lake will significantly reduce annual flood damage and will provide a high quality water supply for the area. Low flow augmentation will enhance the downstream environmental setting by providing a more constant and stable flow of good quality water. The lake will provide an excellent recreational resource situated in scenic surroundings, readily available to large and growing urban areas. The lake will result in increased fishery but about 1,137 acres of wildlife habitat will be lost. Some oil recovery operations will be affected as well as county roads, pipelines, utility lines, and about 25 graves will have to be relocated. Possible alternatives included diversion of floodwaters, flood protection by levees, channel enlargement, development of Birch Creek as a recreational stream, and no action. (Conko-Florida)
W74-05809

NEW MELONES LAKE, STANISLAUS RIVER, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Sacramento, Calif.
Available from National Technical Information Service, Springfield, Va, 22151, as EIS-CA-72-4903-F, $15.75 paper copy, $1.45 microfiche. July 1972. 274 p, 25 chart, 8 map, 8 photo.

Descriptors: Environmental effects, *Reservoirs, Surface waters, *Dams, Flooding(Intentional inundating), Dam construction, Damsites, Water control, Backwater, *Flood control, Water utilization, Water supply, Water storage, Water transfer, Hydroelectric power, *California, Wildlife, Recreation.
Identifiers: *Environmental Impact Statements, *New Melones Lake(Cal).

This project consists of a dam across the Stanislaus River at New Melones Lake, California, to impound up to 2,400,000 acre-feet of water. The river below the dam will be maintained at a capacity of 8,000 cubic feet per second and provide for the protection of fish and wildlife resources. Flood protection will be provided for existing and potential agricultural lands and suburban areas of several communities. Other project benefits include general recreation, conservation yield, hydroelectric power generation, water quality control flows, and fish and wildlife. About 10,700 acres of land, much of which is used by wildlife, will be inundated along with 16 miles of river including the existing Melones Dam. The portion of the river that is presently used by whitewater boating enthusiasts will be inundated. There will be an overall net loss in wildlife population and a number of caves and archeological sites will be inundated. Project benefits will induce development in the region resulting in further loss of natural resources. Other alternatives considered were a smaller reservoir, reservoir at a different site, channel and levee improvement, flood plain management, and no action. (Conko-Florida)
W74-05810

HAVASU INTAKE CHANNEL, HAVASU PUMPING PLANT AND BUCKSKIN MOUNTAINS TUNNEL, ARIZONA-NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boulder City, Nev. Region 3.
For primary bibliographic entry see Field 8C.
W74-05812

AUGMENTING WATER SUPPLIES OF THE VOLGA RIVER AND DIVERTING PART OF THE RUNOFF OF NORTHERN RIVERS SOUTHWARD (O POVYSHENII VODOOBESPECHENNOSTI R. VOLGI I PEREBROSKE CHASTI STOKA SEVERNYKH REK NA YUG),
For primary bibliographic entry see Field 3B.
W74-05836

COMPLEX USE OF VOLGA WATER RESOURCES (KOMPLEKSNOYE ISPOL'ZOVANIYE VODNYKH RESURSOV VOLGI),
For primary bibliographic entry see Field 3F.
W74-05837

MODELS OF SPRING RUNOFF FORMATION AND PROBLEMS IN THEIR USE FOR FORECASTING THE FLOOD HYDROGRAPH,
Gidrometerologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2A.
W74-05842

ENGINEERING AND GEOGRAPHICAL PROBLEMS IN THE DESIGN AND OPERATION OF LARGE LOWLAND RESERVOIRS (INZHENERNO-GEOGRAFICHESKIYE PROBLEMY PROYEKTIROVANIYA I EKSPLUATATSII KRUPNYKH RAVNINNYKH VODOKHRANILISHCH).
Akademiya Nauk SSSR, Moscow. Institut Geografii.
Izdatel'stvo 'Nauka', Moscow, Vendrov, S.L., editor, 1972. 240 p.

Descriptors: Reservoirs, *Reservoir design, *Reservoir operation, *Regulation, *Shores, Shore protection, Backwater, Water levels, Reservoir silting, Bottom sediments, Beds, Navigation, Shoals, Shallow water, Meteorology, Ice, Soils, Vegetation, Forests, *Forecasting.
Identifiers: *USSR.

Various aspects of the influence of large lowland reservoirs of the USSR on shorelines and adjacent areas are examined. Special attention is given to procedures for forcasting changes in natural conditions in the zone of influence of the reservoirs and to practical recommendations for improving reservoir systems. (Josefson-USGS)
W74-05845

FLOOD PROFILES AND INUNDATED AREAS ALONG THE LOWER NISQUALLY RIVER, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2E.
W74-05849

THE ESTIMATION OF FLOOD FLOWS FROM NATURAL CATCHMENTS,
Transport and Road Research Lab., Crowthorne (England).
C. P. Young, and J. Prudhoe.
Available from NTIS, Springfield, Va 22151 PB-223 110; Printed copy $5.50 printed copy; $1.45 microfiche. Report LR-565, 1973. 63 p, 27 fig, 5 plate, 5 tab, 14 ref, 2 append.

Descriptors: *Peak discharge, *Rainfall-runoff relationships, *Runoff forecasting, Streamflow forecasting, Storm runoff, Flood forecasting. Identifiers: Road Research Laboratory method.

A method of estimating floodflows from natural catchments at desired return periods is based on rainfall and runoff data recorded on a continual basis for several years at natural catchments adjacent to motorways. A statistical analysis of the rainfall and streamflow data was used to determine the significant factors in an equation relating a time of concentration to catchment features. Peak rates of flow may then be calculated using the Bilham rainfall formula, the average annual rainfall fo the catchment, and the catchment area. The method is based on data from natural catchments with an underlying stratum of clay or boulder clay and, when tested on similar gaged catchments, gives reasonable agreement between the calculated and observed flows. The method is primarily for the calculation of peak rates of flow and is not intended for the determination of complete hydrographs. (Knapp-USGS)
W74-05850

LONG-DISTANCE TELEMETRY OF DATA FOR FLOOD FORECASTING,
Institute of Hydrology, Wallingford (England).
I. C. Strangeways, and L. Lisoni.
Nature and Resources, Vol 9, No 4, p 18-21, October-December 1973. 2 fig.

Descriptors: *Flood forecasting, *Telemetry, *Warning systems, Water levels, Floods, Data transmission.
Identifiers: *Brazil.

Telemetry methods are used in forecasting of floods in the Pantanal region of Brazil. The system is an easily maintained, reliable and comparatively low-cost radio telemetry system capable of transmitting measurements of river level and rainfall over large distances in areas difficult of access. It will permit forecasts of the level of the Paraguay River to be made, and is well suited to use in similar large undeveloped areas. (Knapp-USGS)
W74-05859

NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM, FORECAST PROCEDURES.
National Weather Service, Silver Spring, Md.
Available from NTIS, Springfield, Va. 22151 as COM-73-10517. Price $3.00 printed copy; $1.45 microfiche. NOAA Hydrologic Research Laboratory Technical Memorandum NWS HYDRO-14, December 1972. 252 p, 21 fig, 8 tab, 10 ref, 9 append.

Descriptors: *Streamflow forecasting, *River forecasting, *Model studies, *Digital computers, *Computer programs, Systems analysis, Input-output analysis, Hydrologic data, River basins, Methodology, Runoff forecasting, Weather forecasting, Hydrology.

The National Weather Service River Forecast System (NWSRFS) consists of several components such as data acquisition, forecast procedures, and forecast dissemination. This report describes a complete river forecast procedure and purposes: (a) a guide for implementation of conceptual river forecasting models by field offices, (b) a tool for use in testing and evaluating new concepts and procedures by the Hydrologic Research Laboratory (HRL), Silver Spring, Maryland, and (c) a vehicle for providing the results to others in the hydrologic community. Described are the techniques and programs needed for developing operational river forecasts based on the use of a continuous conceptual model, from the initial processing of basin data to the preparation of forecasts. The programs are written for a large-capacity digital computer and are generalized for use on any river system. Thus, they may or may not be the most efficient programs for use in a particular situation. (Woodard-USGS)
W74-05861

FLOOD PLAIN INFORMATION-BACK CREEI IN ROANOKE COUNTY, VIRGINIA.
Army Engineer District, Wilmington, N.C.
Prepared for Fifth Planning District Commissior May, 1972. 24 p, 12 figs, 16 pl, 5 tab.

Descriptors: Floods, Flooding, *Flood data *Flood forecasting, *Flood plains, *Virginia Flood control, Flow characteristics, Floo frequency, Flood recurrence interval, Maximur probable flood, Land use, River flow.
Identifiers: *Roanoke County(Virginia), *Bac Creek floodplain(Virginia), Intermediate Region Flood(IRF), Standard Project Flood(SPF), Floo Plain Management(FPM).

The Back Creek floodplain, approximately 3 mile south of the City of Roanoke, is largely ur developed. The Back Creek Basin is about 1 miles long with an average width of 3.5 miles. appears future development will include re sidences and small businesses. Agricultur development, some residences, small businesse and an auto raceway now exist. This report is in tended as an aid in future land-use planning an for management decisions concerning plain utiliz tion. Floods usually occur in the summer, fall, an winter, appearing quickly and with short duratior Most of the 35 bridges and culverts crossing th streams will be obstructive to floodflows. The Cit of Roanoke has placed some restrictions upo development in flood plain areas with agricultur facilities, public recreational areas, horse acade mies and stables being permitted. No flood contr projects exist or are authorized for the study are or upstream in the watershed. Floods occurred i 1948 and 1959, with floods of greater magnitud predicted since larger floods occurred in the pa on streams in the same geographic region and wit similar physiographical characteristics. Bac Creek areas inundated by an Intermediate Re gional Flood would include residences, bus nesses, and public utilities near Starkey, wit more severe problems in a Standard Project Floo Most of the 35 area bridges are high enough t escape inundation. In an Intermediate Proje Flood, water velocity would be 7-20 feet/second causing streambank and bridge abutment erosio slightly higher velocities would accompany a Star dard Project Flood. (Grden-North Carolina)
W74-05866

FLOOD PLAIN INFORMATION: NEUS RIVER-ADKIN BRANCH, CITY OF KINSTON NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
April, 1972. 34 p, 10 fig, 15 pl, 6 tab.

Descriptors: Floods, Flooding, *Flood data *Flood forecasting, *Flood plains, *North Carolina, Flood control, Flow characteristics Flood frequency, Flood recurrence interval, Maximum probable flood, Flood damage, River flow Floodwater.
Identifiers: *Kinston(N.C.), *Neuse River(N.C Intermediate Regional Flood(IRF), Standard Pro ject Flood(SPF).

Located on the Neuse River, Kinston is becomin an important eastern N.C. manufacturing an commercial center. The Neuse floodplain is broa and partially developed, with 40% of the lan woodland and 25% agricultural land. Pressure ex ists to develop land adjacent to highways in th floodplain for commercial and industrial use Major floods occur during all seasons, with th worst flood occurring in July, 1919. Under existin conditions future flood flow would cover a large part of Kinston. Quantities of floatable materia stored on floodplain lands may be carrie downstream causing severe damage to structure and clogging openings of bridges and culverts During an Intermediate Regional Flood wate velocity would reach 5 ft./second causing stream bank erosion; slightly higher velocities woul occur for a Standard Project Flood. Floodwater rise slowly and remain high for long periods. N

city or county regulatory measures specifically for the reduction of flood damage exist. Channel improvements along Adkin Branch which has a highly developed floodplain are expected to provide maximum protection from flooding from local runoff but will not materially reduce flood stages in the stream created by Neuse River floods. Construction of the Falls Lake project, a multi-purpose reservoir, to be located about 145 miles upstream from Kinston on the Neuse River is scheduled for completion in December, 1975. By controlling about 28% of the drainage area above Kinston, this project should have a regulating effect on the Neuse River at Kinston of about 2 1/2 feet depending upon the magnitude of flood events. (Grden-North Carolina)
W74-05867

FLOOD PLAIN INFORMATION - NEUSE RIVER, STONEY CREEK, AND LITTLE RIVER, GOLDSBORO, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
February, 1972. 19 p, 24 pl, 9 tab.

Descriptors: Floods, Flooding, *Flood data, *Flood forecasting, *Flood plains, *North Carolina, Flood control, Flow characteristics, Flood frequency, Maximum probable flood.
Identifiers: *Goldsboro(North Carolina), *Neuse River(N.C.), Stoney Creek(N.C.), Little River(N.C.), Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

Goldsboro is one of the largest cities serving the Coastal Plains agricultural area of North Carolina. Neuse River and its tributaries, Stoney Creek and Little River flow southward and drain a fairly large portion of the city. Flood plain development includes residential, commercial, and industrial development, with railroads, utility lines, sewage treatment facilities, and a hospital. Continuing urban expansion is expected into the flood plains. A city zoning ordinance restricts the use of a portion of Stoney Creek's flood plain but there are no ordinances for the other flood plains in or near Goldsboro. This study was requested to serve as a basis for development of flood plain management measures. Most flooding occurs in the spring and early fall, with flood flow obstruction created by 15 bridges and culverts and agricultural implements stored outside in the flood plain. Considerable damage to commercial, industrial and residential sections and to public and private utilities would occur during an Intermediate Regional Flood with maximum velocities that would occur in the main channel of the streams described ranging from 5.4 ft. per sec. to 5.9 ft. per sec. Low overflow banks would result in deposits of silt and debris, especially around bridges. A Standard Project Flood would create more severe damage because of higher velocities with channel flow, ranging from 6.5 ft. per sec. to 8.8 ft. per sec., wider extent, and greater depths of flooding. (Grden-North Carolina)
W74-05868

THE LAND WATER INTERFACE IN AN URBAN REGION: A SPATIAL AND TEMPORAL ANALYSIS OF THE NATURE AND SIGNIFICANCES OF CONFLICTS BETWEEN COASTAL USES,
Washington Univ., Seattle. Div. of Marine Resources.
For primary bibliographic entry see Field 6B.
W74-05872

MANAGEMENT OF STORM DRAINAGE AND FLOOD CONTROL ACTIVITIES.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 5D.
W74-05878

PLANNING MANUAL FOR STORM DRAINAGE AND FLOOD CONTROL.
Denver Regional Council of Governments, Colo.
For primary bibliographic entry see Field 5D.
W74-05879

FEASIBILITY OF COMBINED SOLID WASTE AND STORM DRAINAGE PROJECTS.
Denver Regional Council of Governments, Colo.
Available from the National Technical Information Service as PB-224 108; $4.25 in paper copy, $1.45 in microfiche. Project REUSE Final Report (Supplement), June, 1972. 42 p, 2 tab, 11 fig. HUD COLO-USE-1. DHUD-H-1392.

Descriptors: *Feasability studies, *Waste disposal, *Storm drains, *Multiple-purpose projects, *Landfills, *Colorado, Solid wastes, Water, Water pollution, Water quality, Urban drainage, Reservoirs, Flood plain, Flood control, Runoff, Sanitary engineering.
Identifiers: *Denver(Colorado), Gravel pits, Project REUSE, Detention ponds, Solid waste management, Sanitary landfills.

Project REUSE demonstrates the feasibility of detention ponding adjacent to a sanitary landfill site, using abandoned gravel pits, to combine urban drainage and flood control with solid waste management in Denver, Colorado. Constraints for the region include use of gravel pits, location in a flood plain, and local hydrological factors. Three approcahes developed include on-stream detention ponds upstream of dikes formed by solid waste landfill, use of landfill to fill existing gravel pits for land reclamation, and use of abandoned gravel pits to provide detention storage. Sites were evaluated, and the Littleton Recreation Area was selected for the first approach. Results show problems with water pollution and economic feasibility due to small scale. Further research is needed, including developing dike-top flood erosion protection and more effective plastic and butyl rubber lines for landfill isolation, to make these approaches feasible. Sanitary landfill minimizes detrimental effects incurred by urban systems, and detention ponds reduce flood damage by controlling runoff. Synergistic benefits could occur in a multi-purpose project, including landforms built of landfilled material, increased environmental protection and economy, and reservoirs constructed over landfills. (Grden - North Carolina)
W74-05880

THE PHYSICAL SETTING OF THE COLORADO RIVER BASIN,
California State Water Resources Control Board, Sacramento.
W. D. Maughan.
American Association for the Advancement of Science 140th Paper presented at meeting, San Francisco, Feb. 1974. 16 p, 11 ref.

Descriptors: River basins, *Mexican Water Treaty, *Interstate rivers, *River basin development, *Salinity, *Colorado River basin, Colorado River Compact, Rocky Mountain Regions, Rivers, Arizona, California, Colorado, Water resources development, River systems, Water quality, Water pollution, Return flow, Irrigation, Geologic history, Geomorphology, Erosion.

Physical and historical aspects of the Colorado River Basin are described. The topography of the Basin is presented, with emphasis on the tributaries and on the Colorado River itself. A detailed geologic and morphologic history of the basin describes the origin of the erosional features for which the region is so famed. Mineral resources of the area are judged significant in crude oil, oil shale, coal, copper, uranium, molybdenum, trona and limestone. These resources acquire additional importance in light of the present energy crisis. Short descriptions of land resource utilization, water supply, and population are presented. The water quality problem of the Colorado River is discussed from a historical point of view. The changes of water quality along the river are described. The extensive water resources development along the Colorado is discussed in relation to the water quality of the river system. (Muller-Arizona)
W74-05921

DEMANDS ON NATIONAL FORESTS REQUIRE COORDINATED PLANNING,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
P. F. O'Connell, and R. S. Boster.
Arizona Review, Vol 23, No 2, p 1-7, February 1974. 3 fig, 1 tab, 12 ref.

Descriptors: *Forests, *Forest management, *Forest watersheds, *National forests, *Demands, Lumbering, Trees, Land use, Natural resources, Water resources, Water policy, Land resources, Land management, Recreation, Regional economics, *Arizona, Water costs, Water management(Applied).

An ever-increasing number of often conflicting demands are being placed on the National Forests of the United States. The resource policy of the Forest Service must change in correspondence with these changing demands. Economic values must now be considered in such policy. The 10,000-acre study area north of the Mogollon Rim in Arizona is used to illustrate this consideration. In this area, timber, range water and recreation compete for the use of the forest. About two-thirds of the runoff goes into the Little Colorado while one-third enters the Salt and Verde Rivers. The increment of this water is calculated with respect to downstream users and compared to the incremental values of the competing demands. The price for these demands is compared to the ability to pay for the demand and this bracket is used to identify the marginal value of the demand which is used in the economic decision making process in forest management policy. (Muller-Arizona)
W74-05926

INTERREGIONAL PLANNING OF WATER RESOURCES ALLOCATIONS BY SYSTEMS ANALYSIS APPROACH,
Utah Water Research Lab., Logan.
J. E. Keith, J. C. Anderson, A. B. King, M. H. Anderson, and T. C. Anderson.
A Summary Report, PRWG 100-5, July 1973. 41 p, 14 fig, 14 tab, 65 ref, append.

Descriptors: *Water supply development, *Utah, *Water allocation(Policy), *Water demand, *Water delivery, *Water utilization, *Economic efficiency, Linear programming, Optimization, Planning, Costs, Constraints, Methodology, Marginal costs, Systems analysis, Mathematical models.

Water allocation in Utah involves considering: (1) the allocation of water itself; and (2) the allocation of water-related resources necessary to distribute the water, both of these requiring relatively large investments of public funds. The availability of and demand for water were studied using a systems approach. A supply and demand model was used to determine efficient (optimal) allocations; since the problem is highly complex, mathematical programming techniques using computer technology were utilized, enabling the generation of optimum values for the variables as well as shadow prices which represent marginal cost or value of those variables. The general objective was to develop a methodology for determining optimal allocations of water in Utah, given alternative assumptions and constraints. The approach was to structure a statewide model of water use and delivery in a linear programming framework, explicitly including the water supply system, various water demands, and alternative water salvage, reuse, and transfers under consideration by water planners. Optimal solutions to the statewide programming model were based upon maximizing net economic returns to water use in the state, given

the alternative assumptions, and were therefore the economically efficient allocations of Utah's water supplies. Given the determination of the efficient allocations over the projected time frame, the economic costs of prematurely investing in transfer facilities or of limiting the use of low-cost water sources were estimated using losses in producers' and consumers' surplus. (Bell-Cornell)
W74-05932

OPTIMUM RESERVOIR OPERATING POLICIES AND THE IMPOSITION OF A RELIABILITY CONSTRAINT,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
A. J. Askew.
Water Resources Research, Vol 10, No 1, p 51-56, February 1974. 1 fig, 4 tab, 13 ref.

Descriptors: *Reservoir operation, *Dynamic programming, *Simulation analysis, Economics, Methodology, *Probability, *Failures, *Stochastic processes, Water supply, Reservoir releases, *Optimization, Mathematical models, Systems analysis.
Identifiers: Operating policy, Benefit maximization.

Stochastic dynamic programming provides a very efficient means of deriving optimum operating policies that maximize the expected net dollar benefits for a water resource system. These policies may give rise to significant probabilities of system failure. Such probabilities can be estimated by system simulation. An iterative procedure is proposed in which the combined use of dynamic programming and simulation allows an optimum operating policy to be derived that will maximize the expected net benefit and at the same time will restrict the probability of failure to an acceptable level. Limitations to failure are applied directly by imposing a fixed penalty on the system whenever it fails, thus inducing amendments in the optimum policies derived. Further developments of the technique are foreshadowed. (Bell-Cornell)
W74-05934

OPTIMAL DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS,
Thomas J. Watson Research Center, Yorktown Heights, N.Y.
U. Shamir.
Water Resources Research, Vol 10, No 1, p 27-36, February 1974. 1 fig, 2 tab, 31 ref.

Descriptors: *Water distribution(Applied), *Design, *Operation and maintenance, *Methodology, Economics, Constraints, Performance, Physical properties, Optimization, Pipes, Flow, Reservoirs, Water levels, Hydraulics, Costs, Computer programs, Mathematical models, Systems analysis, Equation.
Identifiers: *Looped networks, *Newton-Raphson method, Operating policy, Sensitivity, Analysis.

A methodology is developed for optimal design and/or operation of a water distribution system that is to operate under one or several loading conditions. Decision variables may be design variables, such as pipe diameters, or control variables, such as heads and flows. The general formulation considers the cost of the design and the cost of operating the system. The objective function may include the initial cost of the design, the cost of operation, the physical measures of performance, and the penalties for violating constraints. Constraints may be imposed on the decision variables and on the performance of the system under each loading. The model for the flow problem is based on node equations. Flow solutions are obtained by a modified Newton-Raphson method employing sparse matrix techniques. Optimization is obtained by a combination of the generalized reduced gradient and penalty methods. Implementation in a computer program and its use on a test problem in both batch and time-sharing modes are described, and it is concluded that the method is computationally feasible. The many different ways in which it can be used to analyze, design, and operate water distribution systems are outlined. (Bell-Cornell)
W74-05937

MODELING THE REGULATION OF LAKE SUPERIOR UNDER UNCERTAINTY OF FUTURE WATER SUPPLIES,
Sun Oil Co., Dallas, Tex.
S. Y. Su, and R. A. Deininger.
Water Resources Research, Vol 10, No 1, p 11-25, February 1974. 13 fig, 7 tab, 11 ref, 3 append.

Descriptors: *Lake Superior, *Regulation, *Water levels, *Markov processes, *Water supply, *Stochastic processes, Optimization, Algorithms, Inflow, Mathematical models, Systems analysis, *Risks.
Identifiers: Operating policy, Economic loss functions, Data, Sensitivity analysis.

The regulation of the water levels of Lake Superior, via control at its outlet, has been considered. A general one-lake system is described, for which an optimization model is then developed, and a method for finding an optimal operating policy is introduced. The inflows to the lake are treated as stochastic random variables. The objective was to find operating policies that minimized the expected undiscounted yearly losses over an infinite time horizon. The system was modeled as a periodic Markovian decision problem. A new algorithm based on White's method of successive approximations for solving single chained and completely ergodic Markovian decision problems was developed and proven to be fairly efficient in terms of computer storage and computation time. Transition probabilities of the inflows were estimated from 64 years of data. The economic loss functions used in the model considered the losses due to navigation inconvenience and shore property damage. An extensive sensitivity analysis was conducted to determine their influence on the optimal operating policies. To show the validity of the model, the newly developed policies were tested against the current operating policy by using the historical inflow record as data. The results show that if some of the developed operating policies were adopted, the average yearly losses could be reduced by at least 15%. Concurrently, monthly lake level variances could be reduced by 25%. (Bell-Cornell)
W74-05938

ECOLOGICAL AND PHYSIOLOGICAL PRINCIPLES OF PROTECTIVE AFFORESTATION IN SEMIDESERTS, (IN RUSSIAN),
S. Ya. Kraevoi.
Nauka: Moscow. 1970. 240p. Illus.
Identifiers: Animals, Deserts, Drought, *Ecological studies, *Forestation, Growth, Physiological studies, Salt, Soils, Trees, *USSR, Vegetation, *Semi-arid lands.

Protective afforestation trials on light-chestnut soils of solonetzic complex are described. The effectiveness of the growth of trees in relation to soil conditions and other environmental factors is discussed. The following topics are covered: the history of afforestation in the Ergenyakh area, Yakutsk, ASSR, USSR; climatic peculiarities of the area; soils, vegetation and animals of the Arshan-Zel'men' Station of the Laboratory of Forestry of the Academy of Sciences of the USSR; water regimen of trees and of light-chestnut and solonetzic soils under the protective forest stands in the central Ergenyakh area; dependence of tree growth and development on ecological conditions; salt and drought resistance; and scientific principles of the afforestation agricultural technique used in the central Ergenyakh area.--Copyright 1973, Biological Abstracts, Inc.
W74-05945

LARCH PLANTATIONS IN THE FORES STEPPE ZONE, (IN RUSSIAN),
A. M. Shebalov.
Tr Ural Lesotekh Inst. 21, p 328-33. 1970.
Identifiers: Caragana-arborescens, *Forest stepp zone, *Larch plantations, Larix-sukaczewii, Pin Plant, Productivity, Sambucus-racemosa, Tili cordata, *USSR(Chelyabinsk region).

The introduction in forest plantations in the Ch lyabinsk region, USSR, of Larix sukaczewii condusive to an increase of productivity of th forests. Loamy gray forest and chernozem soi are most suitable for the larch plantations. mixed stand with a density of 6000-7000 plants/h consisting of 30-50% L. sukaczewii is preferre The most successful type of stand is a mixture L. sukaczewii and pine spearte rows: the larc here exceeds pine in height and diameter growt Caragana arborescens planted in rows between th rows of larch on dark gray forest soils with a stab water regime is condusive to the growth of larc and pine. Stands with larch and C. arborescens pure rows have high indexes of height and diam ter growth. In stands with closed canopies th process of natural pruning proceeds well. Tilia co data is promising as an associate tree species, ar Sambucus racemosa as an underwood species. Copyright 1973, Biological Abstracts, Inc.
W74-05946

4B. Groundwater Management

AN ANALYTICAL INTERDISCIPLINAR EVALUATION OF THE UTILIZATION OF TH WATER RESOURCES OF THE RIO GRAND IN NEW MEXICO: MIDDLE RIO GRANDE RI GION,
New Mexico State Univ., University Park. Dep of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W74-05408

SUBSURFACE ASPHALT MOISTURE BAI RIERS IN SANDY SOILS,
Delaware Univ., Newark. Dept. of Agricultur Engineering.
E. N. Scarborough, and W. C. Liebhardt.
Available from the National Technical Inform tion Service as PB-229 518, $4.00 in paper cop $1.45 in microfiche. University of Delawa Agricultural Experiment Station Bulletin 401, Jun 1973. 15 p, 10 fig, 4 tab, 6 ref, append. OWRR A 012-DEL(2).

Descriptors: *Groundwater barriers, *Soil wat movement, *Leaching, *Fertilizers, Sands, Wat pollution control, Soil-water-plant relationship Crops, Nitrates.
Identifiers: *Soil water barriers.

A subsurface asphalt moisture barrier as an aid soil moisture retention and reduction of nitra leaching in sandy soils was investigated. In fie studies with six vegetable crops grown on loam sand soils, average yield increases of all crop over the barrier were 46%, 58%, and 55% for 196 1968, and 1969, respectively. Yield increases we the result of increased water retention of the so and reduced nitrate leaching from excessive rai fall. In laboratory leaching studies using high rat of nitrogen, the mean nitrate movement was ap proximately six inches of soil depth per inch water applied. Approximately 2-1/2 times as muc nitrate remained in the top two feet of soil over th barrier compared to when no barrier was used an five inches of water was applied. The aspha moisture barrier is an effective production tool fo growing vegetable crops in sandy soil where irrig tion is not feasible, especially under conditions short periods of drought and occasional heav rainfalls. (Knapp-USGS)
W74-05412

EW DIRECTIONS IN U.S. WATER POLICY--UMMARY, CONCLUSIONS AND RECOM-IENDATIONS FROM THE FINAL REPORT OF HE NATIONAL WATER COMMISSION.
lational Water Commission, Arlington, Va.
or primary bibliographic entry see Field 6B.
/74-05522

/ATER FOR INDUSTRIAL DEVELOPMENT IN 'ALHOUN, CHICKASAW, CHOCTAW, ;RENADA, MONTGOMERY, WEBSTER, AND ALOBUSHA COUNTIES, MISSISSIPPI,
ieological Survey, Jackson, Miss.
or primary bibliographic entry see Field 3E.
/74-05525

;ROUND-WATER DATA FOR HARRIS COUN-Y, TEXAS: VOLUME II--RECORDS OF 'ELLS, 1892-1972,
ieological Survey, Austin, Tex.
.. K. Gabrysch, W. L. Naftel, G. D. McAdoo, and '. W. Bonnet.
exas Water Development Board Report 178, anuary 1974. 181 p, 11 fig, 7 ref.

lescriptors: *Data collections, *Hydrologic data, Texas, *Water wells, Sampling, Water analysis, Vater yield, Water levels, Aquifer testing, Land ubsidence, Groundwater.
dentifiers: *Harris County(Tex).

he collection of hydrologic data in Harris Coun-/, Texas, was begun by the U.S. Geological Sur-ey in 1929. The data-collection program consists f an inventory of new large-capacity and other elected wells, the collection of water samples rom wells for chemical analyses, an inventory of roundwater pumpage, water-level measurements i observation wells, pumping tests on large-apacity wells, and a compilation of information n land-surface subsidence. This report presents ecords of 2,635 wells in 10 areas in Harris County iat have been collected as part of the inventory rom 1929 to 1972. (See also W74-05528) (Knapp-ISGS)
/74-05527

;ROUND-WATER DATA FOR HARRIS COUN-Y, TEXAS: VOLUME III--CHEMICAL .NALYSES OF WATER FROM WELLS, 1922-1,
ieological Survey, Austin, Tex.
.. K. Gabrysch, W. L. Naftel, and G. D. McAdoo.
exas Water Development Board Report 178, ebruary 1974. 87 p, 1 fig, 5 ref.

lescriptors: *Data collections, *Hydrologic data, Water quality, *Texas, Sampling, Water chemis-y, Water analysis, Silica, Iron, Manganese, Cal-ium, Magnesium, Sodium, Potassium, Bicar-onates, Sulfates, Chlorides, Fluorides, Nitrates, hosphates, Hardness(Water), Groundwater, /ater wells.
lentifiers: *Harris County(Tex).

he collection of hydrologic data in Harris Coun-/, Texas, was begun by the U.S. Geological Sur-ey in 1929. The data-collection program consists f water-level measurements in observation wells, ie collection of water samples from wells for iemical analyses, an inventory of groundwater umpage, an inventory of new large-capacity ells, and pumping tests on new large-capacity ells. This report presents chemical analyses of ater from 737 wells for the period 1922-71. (See so W74-05527) (Knapp-USGS)
/74-05528

VAILABILITY OF GROUND WATER IN THE EDERAL WAY AREA, KING COUNTY, /ASHINGTON,
eological Survey, Tacoma, Wash.
. R. Cline.
pen-file report, 1969. 60 p, 6 fig, 4 tab, 4 ref, ap-end.

Descriptors: *Groundwater, *Water yield, Hydrogeology, Hydrologic data, Washington, Aquifers, Drawdown, Glacial drift.
Identifiers: King County(Wash).

The availability of large supplies of groundwater was studied in the Federal Way area in southwestern King county. The most productive aquifer in the 31-square-mile area is a deposit of sand and gravel that underlies glacial till in the central part of the area. Most of the wells that tap groundwater in this buried glacial channel will yield more than 500 gpm, and one well produces 2,600 gpm. The wells here have specific capacities of 10 gpm or more per foot of drawdown. Coefficients of transmissibility of the aquifer range from about 200,000 to 600,000 gpd per foot. Annual recharge to the groundwater reservoir in the area is by local precipitation and is estimated to average about 16 inches, or about 8.8 billion gallons. Probably no more than about one-half of this, or 4.4 billion gallons per year, can be withdrawn through wells without causing undesirable effects, such as excessive declines of groundwater levels and of the low flows of streams draining the area. The amount of water pumped in 1967 by Water Districts 64 and 100 was 1.03 billion gallons, an increase of 65% in just 2 years. Much of the water withdrawn probably returns to the groundwater reservoir through percolation from septic tanks and drain fields. (Knapp-USGS)
W74-05545

A SUMMARY ON GROUND WATER IN THE HAN RIVER BASIN, REPUBLIC OF KOREA,
Geological Survey, Reston, Va.
J. T. Callahan, and Il Choi Seung.
Reprint from The Memoirs for Professor Chi Moo Son's Sixtieth Birthday, December 1972. 4p.

Descriptors: *Groundwater resources, *Water wells, *Water quality, *Hydrogeology, *Foreign countries, Water supply, Water utilization, Aquifer characteristics, Pumping, Water yield, Groundwater recharge, Storage capacity, Water resources development, Projections, Reviews.
Identifiers: *Han River basin(Korea), *Republic of Korea.

The Han River basin occupies 26,200 sq km, most of the northern fourth of the Republic of Korea, and extends north of the Demilitarized Zone (DMZ) into North Korea. The basin also includes the Imjin River basin which was not included in this investigation because it is within the DMZ at its confluence with the Han River, and much of its area is military controlled or north of the DMZ. In 1969 groundwater use in the Han River basin was estimated to have been about 330 million cu m, about 17% of the total water requirement. The estimated annual yield of groundwater from the bedrock aquifers is at least 4,000 million cu m, and that of the alluvial sand and gravel deposits is at least 5,000 million cu m. Groundwater in storage in the bedrock and alluvium is estimated to be about 62,000 million cu m. Annual pumpage of about 3% of storage will meet the projected groundwater requirement of the year 2001 (2361 million cu m). On the average groundwater pumped from storage will be recharged annually during the summer rainy season. The chemical quality of groundwater is good for irrigation and municipal use and most industrial uses. Total dissolved solids are usually less than 300 mg/liter. Sewage effluents have caused pollution of many shallow wells in villages. (Woodard-USGS)
W74-05546

GROUNDWATER RECHARGE WITH TREATED WASTEWATER,
Wisconsin State Univ., Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 5D.
W74-05552

BASE OF FRESH GROUND WATER--APPROXIMATELY 3,000 MICROMHOS--IN THE SACRAMENTO VALLEY AND SACREMENTO-SAN JOAQUIN DELTA, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W74-05553

THE WATER TABLE ON LONG ISLAND, NEW YORK, IN MARCH 1970,
Geological Survey, Mineola, N. Y.
G. E. Kimmel.
Long Island Water Resources Bulletin No 2, 1971. 8 p, 2 fig, 16 ref.

Descriptors: *Water table, *New York, Groundwater, Water supply, Withdrawal, Hydrologic data.
Identifiers: *Long Island(NY).

A net-change map comparing water-table altitudes in Long Island, N Y in 1951 with those in 1970 shows a maximum rise of about 30 feet in Kings County and a maximum decline of about 30 feet in Queens County during this period. In northern Nassau County, net declines generally ranged from 5 to 20 feet. The net change in the water table in virtually all Suffolk County from 1951 to 1970 was less than 5 feet. (Knapp-USGS)
W74-05556

GROUNDWATER OF PASTURES OF KAZAKHSTAN (PODZEMNYYE VODY PASTBISHCHNYKH TERRITORIY KAZAKHSTANA).
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Gidrogeologii i Gidrofiziki.
For primary bibliographic entry see Field 2F.
W74-05563

ROLE OF MODELS IN GROUNDWATER MANAGEMENT,
California State Dept. of Water Resources, Sacramento.
E. M. Weber, and A. A. Hassan.
Water Resources Bulletin, Vol 8, No 1, p 198-206, February, 1972. 3 fig, 1 tab.

Descriptors: *Water management(Applied), *Surface-groundwater relationships, *Water resources development, *Computer models, Mathematical models, Groundwater resources, Water utilization, Groundwater potential, Aquifer management, Groundwater movement, Surface water, *Forecasting.

To integrate operation of ground and surface water supplies into their management plans, decision-makers must be able to predict the effects of various alternative modes of operation and meteorological conditions on the groundwater basin. Many types of models have been used for simulating the behavior of groundwater basins under these changes. Analog simulators, analog computers, and digital computers have been employed for model development. To achieve plausible models, detailed hydraulic and hydrologic characteristics are required, such as data on transmissivity, storage, and net deep percolation. These data are used in the equations that form the model. Water quality, which cannot be separated from quantity, deserves equal consideration. Recently, considerable efforts have been made to develop water quality prediction tools through the use of modeling techniques. (Skogerboe-Colorado State)
W74-05680

WATER-MANAGEMENT PROBLEMS RELATED TO GROUNDWATER RIGHTS IN THE SOUTHWEST,
Geological Survey, Menlo Park, Calif.
H. E. Thomas.
Water Resources Bulletin, Vol 8, No 1, p 110-117, February, 1972. 27 ref.

Descriptors: *Water law, *Water rights, *Groundwater, Conjuntive use, Groundwater availability, Groundwater resources, Water supply, Water utilization, Texas, New Mexico, Arizona, California, *Southwest U.S., *Prior appropriation.

The systems of underground water rights for the states of Texas, Arizona, New Mexico and California are summarized. (Skogerboe-Colorado State)
W74-05683

A PROGRESS REPORT ON RESULTS OF TEST-DRILLING AND GROUND-WATER INVESTIGATIONS OF THE SNAKE PLAIN AQUIFER, SOUTHEASTERN IDAHO,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 2F.
W74-05715

GROUND WATER IN THE KANSAS RIVER VALLEY, JUNCTION CITY TO KANSAS CITY, KANSAS,
Geological Survey, Lawrence, Kans.
S. W. Fader.
Kansas Geological Survey, Lawrence, Bulletin 206, Part 2, January 1974. 12 p, 7 fig, 2 plate, 5 tab, 29 ref.

Descriptors: *Hydrogeology, Kansas, *Alluvial channels, *Groundwater, Conjunctive use, Induced infiltration, Aquifer characteristics, Aquifer testing, Water yield, Transmissivity.
Identifiers: *Kansas River Valley(Kan).

The combined river and alluvial-aquifer systems are the principal source of water for municipal, industrial, and irrigation supplies along the Kansas River valley in northeast Kansas. The depth to water in the valley-fill deposits ranges from 0 to 50 feet below land surface and averages about 25 feet. The valley-fill deposits contained about 1 million acre-feet of groundwater in storage in 1967. Wells yielding more than 1,000 gallons per minute are common. Transmissivity ranges from 5,300 to 48,000 square feet per day and the long-term storage coefficient was estimated to average 0.15. The chemical quality of the groundwater is suitable for most uses; however, the water is generally very hard and may contain as much as 58 milligrams per liter of total iron. (Knapp-USGS)
W74-05848

SINKHOLE PROBLEM ALONG PROPOSED ROUTE OF INTERSTATE HIGHWAY 459, NEAR GREENWOOD, ALABAMA,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 2F.
W74-05857

WATER RESOURCES DATA FOR NEW YORK, 1972: PART 2. WATER QUALITY RECORDS.
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 2E.
W74-05931

4C. Effects On Water Of Man'S Non-Water Activities

EVAPORATION, INFILTRATION AND RAINFALL-RUNOFF PROCESSES IN URBAN WATERSHEDS,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 2A.
W74-05405

EFFECTS OF URBANIZATION ON STREAM CHANNELS AND STREAM FLOW,
Regional Science Research Inst., Philadelphia, Pa.
T. R. Hammer.
Available from the National Technical Information Service as PB-229 836; $17.50 in paper copy, $1.45 in microfiche. Completion Report, November 1973. 272 p, 31 fig, 42 tab, 15 ref. OWRR C-2174(3.

Descriptors: *Channel improvement, *Planning, Runoff, *Land use, *Urbanization, Sedimentation, *Streamflow, *Flood frequency, Pennsylvania, Maryland, District of Columbia, *Forecasting.
Identifiers: Channel enlargement.

Empirical relationships are derived (1) between types of locations and amounts of urban land use and channel enlargement as compared with natural channel size, (2) between channel enlargement and stream flow, and (3) between extent of urbanization and floods of different frequencies. Highly significant relationships were found, based on large numbers of observations. The relationships are applied for purposes of prediction of hydrologic impacts and land use planning. The process of channel enlargement and channel configuration change is studied through permanent measuring stations on five gaged urban streams.
W74-05534

A FACTOR ANALYSIS OF SELECTED WATER QUALITY VARIABLES IN CENTRAL NEW JERSEY DURING 1960-1969,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Geography.
For primary bibliographic entry see Field 5B.
W74-05716

URBAN FLOOD FREQUENCY CHARACTERISTICS,
Espey, Huston and Associates, Inc., Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-05738

ADD SALT TO TASTE,
Habitat, Inc., Belmont, Mass.
For primary bibliographic entry see Field 5B.
W74-05795

MASTER PLANNING METHODOLOGY FOR URBAN DRAINAGE,
Rice (Leonard) Consulting Water Engineers, Denver, Colo.
For primary bibliographic entry see Field 6A.
W74-05834

LAKE NORMAN DEVELOPMENTAL IMPACT STUDY,
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6B.
W74-05869

4D. Watershed Protection

SIMULATION OF THE HYDROLOGY OF UNGAGED WATERSHEDS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W74-05403

WATERSHED MODELS: TOOLS IN PLANNING LAND MANAGEMENT FOR WATER AND POLLUTION CONTROL,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2A.
W74-05570

LITTLE RUNNING WATER DITC WATERSHED PROTECTION, FLOC PREVENTION, AND LAND DRAINAGE I AND D MEASURE PLAN (FINAL ENVIRO MENTAL STATEMENT).
Soil Conservation Service, Washington, D.C.
Available from National Technical Informati Service, Springfield, Va, 22151, as EIS-AR-7 0867-F, for $4.75 paper copy, $1.45 microfic May 11, 1973. 48 p, 1 map, 6 tab.

Descriptors: *Watershed management, *Flo protection, *Arkansas, *Surface drainage, La management, Conservation, Channels, Ditch Watersheds, Flood damage, Runoff, Sheet er sion, Sedimentation, Flood plains, Cana Drainage, Drainage engineering.
Identifiers: *Environmental impact statemen Randolph County, Ark.

The Ozark Foothills Resource Conservation a Development Project is located in Randolph Cou ty, Arkansas. The project is for watershed prote tion, flood prevention, and land drainage. The goals will be achieved by applying land treatme measures and constructing 41 miles of chanr work with appurtenant structures. Land treatme measures are expected to effectively reduce r noff and sheet erosion rates. Flood damages w be reduced. Sedimentation downstream will be i creased during contruction. Ditch bank erosi will be insignificant after revegetation. Agric tural efficiency will be greately increased and t economy and rural development of the area will generally improved. The plant cover and wildli habitat will be temporarily destroyed on one si of the ditches and the ditch fishery will destroyed during construction. Ditch enlargeme will take forty-seven acres of agricultural lan Some accelerated clearing of the 286 acres forest land outside the Black River flood plain m. take place. (Sears-Florida)
W74-05806

BEACH EROSION CONTROL PROJECT, DE RAY BEACH, FLORIDA (FINAL ENVIRO MENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 8A.
W74-05813

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

INVESTIGATIONS OF FRESHWATER SU FACE MICROLAYERS,
Virginia Polytechnic Inst. and State Univ Blacksburg. Dept. of Biology.
R. F. Hatcher, and B. C. Parker.
Available from the National Technical Inform tion Service as PB-229 679, $4.00 in paper cop $1.45 in microfiche. Virginia Water Resourc Research Center Bulletin 64, 1974. 84 p, 6 fig, tab, 30 ref. OWRR A-037-VA(6).

Descriptors: Microbiology, Algae, Fungi, Ba teria, Coliforms, Seston, *Sampling, *Monitorin *Pollutant identification, Surfaces, *Water sar pling.
Identifiers: Surface slicks, *Surface microlayers.

Four surface microlayer sampling devices we compared. The objective of this comparison w to determine relative sampling efficiencies a depths in which water was collected by each sar pler. The results showed that the plate and dru samplers were far superior to the screen and tr samplers in sampling efficiency and in collecting thin surface microlayer. Also several paramete of freshwater surface microlayers were compare to those of water from a 10-cm depth in thr

iquatic environments. The results showed that surface microlayers were often microbiologically and chemically enriched, compared to the subsurface water. The freshwater surface microlayers may have major roles in the recycling of nutrients, incorporation of toxicants into food chains, and the creation of aerosols containing coliform and pathogenic bacteria. Furthermore, the study of surface microlayers offers a sensitive technique of monitoring aquatic environments for certain pollutants such as coliform bacteria, heavy metals, and many pesticides.
W74-05410

WATER QUALITY CRITERIA, SECOND EDITION.
California State Water Resources Control Board, Sacramento.
Publication 3-A, Revised 1963. 548 p, 4 fig, 33 tab, 1,827 ref. Edited by J. E. McKee and H. W. Wolf.

Descriptors: *Water quality standards, *Reviews, *Bibliographies, State governments, Interstate, Legal aspects, Legislation, *Beneficial use, Pollutants, *Radioactivity, *Pesticides, *Toxicity, *Lethal limit, *Water quality control, Water pollution.
Identifiers: Surface active agents.

This January 1973 reprint report serves as a compendium of current literature on the subject of water-quality criteria, and attempts to present the material in a manner that will be most useful to the water-pollution-control boards and their staffs. For this purpose, the report has been cross-referenced extensively. The bulk of the report consists of summaries of literature relating to threshold and limiting concentrations for each potential pollutant with respect to each beneficial use of the water. Each substance or waste that may enter the waters of the State is deemed to be a 'potential' pollutant--potential in the sense that, if concentrated sufficiently, it can adversely and unreasonably affect such waters for one or more beneficial uses; and yet, if diluted adequately, it will be harmless to all beneficial uses. Chapters include: Water Quality Criteria Promulgated by State and Interstate Agencies; Judicial Expression; Quality Criteria for the Major Beneficial Uses of Water; Potential Pollutants; Biological Pollutants; Radioactivity; Pesticides; and Surface Active Agents. (OWRR)
W74-05417

OCCURRENCE, RADIOACTIVITY, AND DIVERSITY, OF WINNIPEG RIVER BENTHIC ORGANISMS IN THE VICINITY OF WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
For primary bibliographic entry see Field 5C.
W74-05418

ENVIRONMENTAL RADIATION SURVEILLANCE OF THE OYSTER CREEK NUCLEAR GENERATING STATION.
New Jersey Dept. of Environmental Protection, Trenton. Div. of Environmental Quality.
Report, July 1973. 121 p, 2 fig, 40 tab, 16 ref. EPA 68-01-0527.

Descriptors: *Survey, *Assay, *Measurement, *Radioactivity, *New Jersey, Nuclear powerplant, Effluents, Cooling water, Bays, Water pollution, Radioisotopes, Air pollution, Fallout.
Identifiers: *Barnegat Bay(N.J.).

New Jersey has maintained an environmental surveillance program for the Oyster Creek Nuclear Generating Station owned by the Jersey Central Power and Light Company since 1965. During 1971 the State initiated a comprehensive environmental study of the plant characterizing the distribution of facility-oriented radionuclides in the various biological and physical components of Barnegat Bay. In April of 1972, the State entered into contract with the U.S. Environmental Protection Agency to provide offsite environmental radiation surveillance data relative to the Oyster Creek facility. Scientific equipment was obtained in order to enable the State to evaluate many of the radiological aspects which were not evaluated in 1971. A summarization is presented of the data and the endeavors of the Bureau of Radiation Protection during the past year. (Houser-ORNL)
W74-05430

CONVERSION OF SOME ORGANOPHOSPHORUS INSECTICIDES ON ADSORBING SURFACES AS AFFECTED BY FORMULATION,
Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 5B.
W74-05435

A NEW BENZENE-ETHANOL-WATER SOLVENT SYSTEM FOR TLC SEPARATION OF AFLATOXINS,
Best Foods Research Center, Union, N.J.
A. E. Waltking, G. W. Bleffert, M. Chick, and R. Fogerty.
Journal of the American Oil Chemists' Society, Vol 50, No 10, p 424-425, October 1973. 1 tab, 3 ref.

Descriptors: *Separation techniques, Aqueous solutions, *Gas chromatography, Solvents, *Chromatography, Organic compounds.
Identifiers: *Aflatoxins, Thin layer chromatography, Gas liquid chromatography, *Solvent systems, Chemical composition, *Benzene, *Ethanol, Mycotoxins.

Gas liquid chromatography was used to determine the composition of the benzene-ethanol-water (BEW) solvent system frequently used in the separation of aflatoxins by thin layer chromatography. Investigation of a rapid procedure for preparing and using this solvent system led to the discovery of a new BEW solvent system with advantages for the routine determination of aflatoxins in roasted nut products, which consists of benzene-ethanol-water 40:6:3 for the trough solution and 4:27:20 for the bottom solution. Because ethanol is the most costly reagent in this solvent system and the bottom layer contains four times as much ethanol as the top layer, it is worthwhile to use the bottom layer repeatedly. The instantly prepared BEW system containing benzene-ethanol-water 41:7:1 in the top layer and 5:28:18 in the bottom layer was used in our laboratory almost exclusively for over a year with repeatedly excellent resolution. The bottom layer (50 ml) was not replaced or supplemented during an entire week's operation, which ranged between 5 and 20 plates, while 25 ml of the top layer was pipetted into a clean trough for each run. Evaluation of this system by six laboratories over the past year has shown it to be consistently superior to the previous BEW solvent system and less affected by climatic conditions. Optimum results are obtained by placement of the developing chamber in a constant temperature cabinet at 68-70F. (Mortland-Battelle)
W74-05436

A STUDY OF THE STABILITY OF A NITROGEN-SELECTIVE THERMIONIC DETECTOR,
Laboratory of the Government Chemist, London (England).
T. A. Gough, and K. Sugden.
Journal of Chromatography, Vol 86, No 1, p 65-71, November 1973. 4 fig, 6 tab, 18 ref.

Descriptors: Stability, *Gas chromatography, *Pollutant identification, Nitrogen, Aqueous solutions, Selectivity.
Identifiers: *Thermionic detector, *Flame ionization detector, Comparative studies, *Nitrogen detector, *Nitrosamines, Performance evaluation, Dimethylnitrosamines, Diethylnitrosamines, Dipropylnitrosamines.

The stability of a thermionic detector fitted with a rubidium chloride tip has been studied by comparison with the performance of a conventional flame ionisation detector. The variations of response of the detectors to a given set of conditions over an extended period of time have been measured. A Pye 104 Chromatograph fitted with thermionic (TD) and flame ionisation detectors (FID) was used. A primary standard solution containing 100 microliters/l of dimethyl-, diethyl-, and dipropylnitrosamines (DMN, DEN and DPN) in water was used throughout the study. 3-microliter aliquots of this and other standards, prepared by dilution, were injected daily over a period of several weeks in order to follow the variations of response of the two detectors. Variations of response of the TD are significantly higher than those of a conventional flame detector. The sensitivity of the TD falls with age, but can be restored by cleaning the probe. For some simple nitrosamines response is a function of nitrogen content. Analysis of dirty extracts does not subsequently affect the sensitivity of the TD. The noise level and detection limits for the nitrosamines are at least an order of magnitude higher on the TD than on the FID. (Mortland-Battelle)
W74-05437

AN AUTOMATIC SAMPLE LOADER FOR COLUMN CHROMATOGRAPHY,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Protein Chemistry.
H. Lindley, R. W. Cranston, W. J. A. Sutherland, and C. L. Ritchie.
Journal of Chromatography, Vol 86, No 1, p 178-183, November 1973. 4 fig, 2 ref.

Descriptors: *Automation, Amino acids, Instrumentation, *Chromatography, Automatic control, *Sampling.
Identifiers: *Column chromatography, *Sample loader, Programmer, Controller.

An automatic sample loader is described that has been used continuously for 3 years with an amino acid analyzer. An electronic programmer controls loading, all timed sequences, a six-position, 10-channel buffer flow valve, and the pumps. Samples are loaded through two discs with four pairs of holes each. These discs are held together by spring pressure and sealed by neoprene 'O' rings recessed into the top disc. The buffer pumps, lines, and connections are held by the stationary top disc. Sample coils, with identical volumes, are held by the rotating bottom disc. Sample overlap is allowed at each end through control of pumping time and use of sample coils of slightly less volume than the sample used. This prevents the loading of air. Approximate loading time is three minutes. Desirable features of the system include: (1) single-dual-column loading, (2) ease of adding or subtracting samples during operation, (3) automatic introduction of samples into the sample loops, and (4) low cost. A possible criticism of the apparatus is the chance evaporation or contamination of samples because the sample cups are not completely sealed. Several points in answer to this criticism are discussed. (Mortland-Battelle)
W74-05438

METAPERIODATE - A NEW STRUCTURE-SPECIFIC LOCATING REAGENT FOR PHENOLIC COMPOUNDS,
University of Strathclyde, Glasgow (Scotland). Dept. of Food Science.
M. N. Clifford, and J. Wight.
Journal of Chromatography, Vol 86, No 1, p 222-224, November 1973. 1 tab, 3 ref.

Descriptors: *Phenols, Aqueous solutions, Ethers, *Chromatography, *Pollutant identification.
Identifiers: *Metaperiodate, *Paper chromatography, *Chromogenic reagents, Dihydroxyphenols, Monomethyl ethers.

The use of metaperiodate as a reagent in detecting phenolic compounds and its structure specificity were investigated. Several compounds listed were dissolved in propan-2-o1 (70 percent w/v) at a concentration of 5 mg/ml. Saturated 5 percent w/v and 0.5 percent w/v aqueous solutions of analytical grade potassium metaperiodate were used as spray reagents. A sheet of Whatman No. 1 chromatography paper was sprayed with one of the metaperiodate solutions and allowed to dry. Each phenolic solution was applied to the metaperiodate-treated papers at levels of 1, 5 and 10 micrograms using a micro-pipette. Failure to produce a detectable color within 10 min was taken as a negative response. Metaperiodate (0.5 percent) detected microgram quantities of o-and p-dihydroxyphenols and their monomthyl ethers by producing a yellow-orange color. This response was essentially independent of other substituents (carboxyl, hydroxyl, methoxyl, propenoic acid), but vanillin, vanillic acid and methyl vanilloyl ketone responded less readily, a 5-microgram loading being necessary to give a positive response. In all other cases a 1-microgram loading was detected. (Mortland-Battelle)
W74-05439

SPECTROPHOTOMETRIC DETERMINATION OF URANIUM(VI) WITH 7-CHLORO-8-HYDROXYQUINOLINE-5-SULPHONIC ACID,
Birla Inst. of Tech. and Science, Pilani (India). Chemical Labs.
B. K. Avinashi, and S. K. Banerji.
Microchemical Journal, Vol 18, No 5, p 543-547, October 1973. 2 fig, 14 ref.

Descriptors: *Spectrophotometry, *Aqueous solutions, *Chemical analysis, *Methodology, Pollutant identification, Cations, Anions, Chelation, Pollutants, Hydrogen ion concentration, Time, Temperature.
Identifiers: *Chromogenic reagents, *Uranium, Ionic interference, Metal chelates, Absorbance, Precision, Trace levels, Chemical indicators, Complexation, 7-Chloro-8-hydroxyquinoline-5-sulfonic acid, Chemical concentration, Chemical composition, Chemical structure, Molar absorptivity, Chemical interference.

Uranium(VI) and 7-chloro-8-hydroxyquinoline-5-sulfonic acid form a 1:2 orange-red complex with gamma sub max at 355 nm, in aqueous solution at pH 6.6. An aliquot of standard uranium solution (38 ppm) is combined with a pH 6.6 buffer, 1 M NaCl04 and 0.002 M reagent. The volume is adjusted to 25 ml with distilled water and the mixture allowed to stand for 30 minutes to attain equilibrium. Absorbance was measured against the reagent blank at 355 nm. The color of the uranium complex develops instaneously and remains constant for at least 24 hours at room temperature. With an increase in temperature, a decrease in the value of absorbance of the complex was observed. A study of the effect of reagent concentration at a pH 6.6 plus or minus 0.1 and 355 nm indicated that there should be at least 6 fold molar excess of the reagent over U(VI) concentration for maximum color formation of the complex. Varying the order in which the reagents were added had no significant effect on the results. Range for adherence to Beer's law, effective photometric range, molar absorptivity, and Sandell sensitivity are reported as 1-38 ppm, 5.7-28.5 ppm, 6575 and 0.036 microgram of uranium/sq cm, respectively. The method has been compared with some other methods for determination of uranium spectrophotometrically, with regard to their sensitivities. Interferences of various ions in the measurement of the color have been investigated, and the tentative structure of the colored species has been proposed. (Holoman-Battelle)
W74-05442

MICRODETERMINATION OF THIOCYANATES WITH N-BROMOSUCCINIMIDE USING BORDEAUX RED AS AN INDICATOR,
Pakistan Council of Scientific and Industrial Research, Lahore.
M. Sarwar, H. A. Waheed, M. A. Chowdhri, and R. J. Thibert.
Mikrochimica Acta, No 5, p 683-688, 1973. 3 tab, 12 ref.

Descriptors: *Volumetric analysis, *Aqueous solutions, Methodology, Chemical analysis, *Pollutant identification, Chemical reactions.
Identifiers: *Thiocyanates, *Bordeaux red, Chemical indicators, *Bromosuccinimide, Precision, Accuracy, Chromogenic reagents.

N-bromosuccinimide has been used as a direct titrant for thiocyanates with bordeaux red as an indicator. In case of ammonium thiocyanate, nitrogen is evolved. While in case of potassium thiocyanate 0.5- to 2-mg samples were analyzed and maximum relative standard deviation was 1 percent in case of 0.5-mg sample. In case of ammonium thiocyanate 0.3- to 2.5-mg samples were analyzed and maximum relative standard deviation was 0.9 percent in case of 0.7-mg sample. The method is quick, precise and accurate. (Holoman-Battelle)
W74-05443

THE DETERMINATION OF BARIUM BY FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY USING A MODIFIED GRAPHITE TUBE ATOMIZER,
G. D. Renshaw.
Atomic Absorption Newsletter, Vol 12, No 6, p 158-160, November/December 1973. 4 fig, 1 tab, 13 ref.

Descriptors: *Pollutant identification, Separation techniques, Solvent extractions, Aqueous solutions, *Spectrophotometry.
Identifiers: *Barium, Flameless atomic absorption spectrophotometry, *Graphite furnace, Atomization, Tantalum liner.

Sensitivities for barium determination are compared by flameless atomic absorption spectrophotometry employing an HGA-70 Graphite Furnace both with and without a tantalum cylinder insert. The mode of barium atomization within the furnace is discussed with reference to carbon-metal atom interactions in order to explain sensitivity differences. A solvent extraction method for the preconcentration of barium, prior to determination in the modified carbon tube furnace, is also mentioned. Solutions containing 1-10 ng Ba/20 microliters were prepared by dilution with distilled water of a 1000 micrograms/ml (w/v) stock solution of barium in 0.1 N HClO4. The solutions were stored in polythene bottles previously soaked in 10 percent HNO3. Analytical grade thenoyltrifluoroacetone (TTA) was dissolved in metyl isobutyl ketone (MIBK) to make a 0.1 M solution. Thymol blue was used as an internal indicator. The tantalum cylinder inserts (liners) were constructed from 0.002-in thick foil (99.9 percent purity). It is estimated that the lifetime of a liner would be equivalent to at least 200 determinations and each liner costs only a fraction of the cost of the replacement carbon tubes. With the tantalum liner insert, the sensitivity increased twenty fold. The detection limit (defined as signal:noise ratio equals 2) with the modified tube is 10. In terms of concentration, the detection limit, assuming one uses the maximum sample volume of 100 microliters is 0.001 ppm). Comparison with the conventional flame nebulizer shows a hundred-fold increase in sensitivity. (Mortland-Battelle)
W74-05444

A PRELIMINARY PROCEDURE FOR THE DETERMINATION OF CADMIUM IN BLOOD,
Department of Employment, London (England). Medical Services Div.
A. A. Cernik.
Atomic Absorption Newsletter, Vol 12, No 6, p 163-164, November/December 1973. 3 fig, 1 tab, 5 ref.

Descriptors: *Cadmium, *Methodology, Oxidation, *Pollutant identification, Heavy metals, Trace elements, *Spectrophotometry.
Identifiers: *Blood, *Atomic absorption spectrophotometry, Biological samples, Delves cup method, Reproducibility.

In such a complex medium as blood, the volatility of cadmium gives rise to difficulties, since this metal has a vapor pressure of 1.0 mm at 394C which is very similar to the temperature of the burning organic matrix. In order to separate the cadmium, it is necessary, therefore, to remove the organic material completely. Using the Delves cup cadmium vaporizes 2.2 sec after insertion of the crucible into the flame. The partial oxidation obtained by hydrogen peroxide described by Delves for blood lead analyses will not suffice for resolution of the matrix from the cadmium. The method described here shows that dry oxidation can produce a clear unobstructed cadmium signal. For replicate 20-microliter samples of blood with 0.0004 microgram cadmium added, dried at 100C, followed by oxidation at 425C for 6.0 min loss of cadmium varies between 6-10 percent. Replication of signals from 20 microliters of blood found to have a concentration of 0.0005 microgram cadmium (2.5 micrograms/100 ml) gave an S.D. equals 0.189 microgram cadmium/100 ml of blood. Absolute sensitivity of the method was 23 pg Cd. If the oxidation step is standardized closely with respect to temperature and time, maximum retention of cadmium can be achieved along with complete resolution from any molecular absorption. (Mortland-Battelle)
W74-05445

RING-DISK ELECTRODE STUDY OF THE ANODIC BEHAVIOR OF GOLD IN 0.2M SULFURIC ACID,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-05446

SEPARATION OF MONOSUBSTITUTED PHENOL ISOMERS USING LIQUID CRYSTALS,
North Dakota Univ., Grand Forks. Dept. of Chemistry.
L. E. Cook, and R. C. Spangelo.
Analytical Chemistry, Vol 46, No 1, p 122-126. January 1974. 1 fig, 5 tab, 21 ref.

Descriptors: *Separation techniques, *Pollutant identification, *Gas chromatography, Methodology, Chemical reactions, Phenols, Time, Chemical analysis.
Identifiers: *Liquid crystals, *Monosubstituted phenols, *Isomeric phenols, Derivatization, Phenyl n-alkyl ethers, Aromatic hydrocarbons, Isomers, Flame ionization gas chromatography, Thermal conductivity gas chromatography, 2-Methylphenol, 3-Methylphenol, 4-Methylphenol, o-Methylphenol, m-Methylphenol, o-Methoxyphenol, m-Methoxyphenol, o-Chlorophenol, m-Chlorophenol.

The separation of several isomeric monosubstituted phenols by gas chromatographic means using liquid crystal stationary phases has been studied. The method described herein utilizes both a derivatization technique, to improve peak symmetry and a liquid crystal stationary phase to increase resolution. The method of preparation of derivatives is simple, fast, and uses only reagents commonly found in the laboratory. The method is amenable to flame ionization and thermal conductivity detectors. While the separation of the isomeric phenols was partially successful, complete separation of the isomers was obtained when the phenols were converted to substituted phenyl n-

alkyl ethers. Separation factors for the meta- and para-substituted ether isomers ranged from 1.06 to 1.25. The effect of increasing the length of the n-alkyl chain was studied and found to increase the separation factor as the chain length increased. The polarity and the molecular shape of the solutes were major factors in determining the separation of the isomers. Converting the phenol to an ether and running the GC analysis required only 1-1/2 hours. (Holoman-Battelle)
W74-05447

DETERMINATION OF CACODYLIC ACID (HYDROXYDIMETHYLARSINE OXIDE) BY GAS CHROMATOGRAPHY,
California Univ., Davis. Dept. of Environmental Toxicology.
C. J. Soderquist, D. G. Crosby, and J. B. Bowers.
Analytical Chemistry, Vol 46, No 1, p 155-157, January 1974. 2 fig, 1 tab, 18 ref.

Descriptors: *Arsenicals(Pesticides), *Pollutant identification, *Soil analysis, *Water analysis, Methodology, Herbicides, Chemical analysis, Chemical reactions, Hydrogen ion concentration, Time, Selectivity, *Gas chromatography.
Identifiers: Electron capture gas chromatography, *Cacodylic acid, Detection limits, Chemical recovery, Derivatization, Gas liquid chromatography, Sample preparation, Distilled water, Iododimethylarsine, Hydroxydimethylarsine oxide, Methanearsonic acid, Retention time.

The conversion of cacodylic acid to iododimethylarsine with hydriodic acid, followed by a determination with electron-capture gas chromatography constitute the method whereby cacodylic acid and its salts can be determined rapidly with detection limits below 0.05 ppm in water and 0.5 ppm in soil. Those parameters that would possibly affect the analytical recovery of cacodylic acid were examined. (1) Recoveries were independent of sample pH and proved the method to be selective. (2) Reaction with hydriodic acid was complete and quantitative within 15 seconds provided that less than 20 microliters of sample water remained per 100 microliter of added hydriodic acid. (3) Iododimethylarsine solutions in organic solvent at ng/microliter levels exhibited decomposition within 30 min. Major advantages include simplicity and rapid analysis; dried soil samples can be weighed, derivatized, and analyzed in less than 10 minutes, and water samples, once evaporated, require a similar amount of time. The instability of iododimethylarsine was circumvented by using a standard curve based on fortification, and by analyzing each sample in triplicate. (Holoman-Battelle)
W74-05448

DETERMINATION OF CYANIDE IN ITS PLATINUM AND PALLADIUM COMPLEXES,
IBM Watson Research Center, Yorktown Heights, N.Y.
B. L. Gilbert, B. L. Olson, and W. Reuter.
Analytical Chemistry, Vol 46, No 1, p 170-171, January 1974. 1 tab, 16 ref.

Descriptors: Methodology, *Pollutant identification, Chemical analysis, Ammonia, Chemical reactions, Pollutants, Heavy metals, Analytical techniques.
Identifiers: *Cyanides, *Platinum, *Palladium, *Metal complexes, Chemical recovery, Chemical interference, Accuracy, Absorbance, Metal cyanides, Stability constants, Ammonium.

An analytical procedure is presented for the quantitative determination of cyanide in the presence of strongly complexing metal ions and large concentrations of ammonium ion. Decomposition of the sample is accomplished in a flow of hydrogen at an elevated temperature. The accuracy of this method was tested with K2Pt(CN)4.3H2O; its stoichiometry was verified by Pt and K analyses. Ten CN analyses were made on samples in the range from 65 to 1200 micrograms using the hydrogen reduction technique. Recoveries of 99 plus or minus 4 percent (STD) were obtained. NH3 precent in excess of 50 micrograms/ml in the final test solution decreases the absorbance of the CN color complex. Nine separate determinations of 43 micrograms of CN in the presence of a 100-fold excess of Pd and NH3 gave an average recovery of 101 plus or minus 5 percent (STD). Similar to NH3, bromide was found to quench the color complex when present in excess of 2 micrograms/ml in the final test solution. (Holoman-Battelle)
W74-05449

DETERMINATION OF POTASSIUM BY MEANS OF THE COTLOVE CHLORIDOMETER,
Wagner Coll. Science Center, Staten Island, N.Y. Dept. of Chemistry.
W. P. Ferren, and J. A. Cucco.
Analytical Chemistry, Vol 46, No 1, p 174-176, January 1974. 2 tab, 21 ref.

Descriptors: *Potassium, *Aqueous solutions, *Gravimetric analysis, *Pollutant identification, Alkali metals, Instrumentation, Laboratory equipment.
Identifiers: *Chloridometer, Coulometry, Potassium nitrate.

A coulometric procedure is described for determination of potassium using the Cotlove chloridometer. In the procedure reported here aqueous potassium nitrate solutions were used. A modified standard chloridometer titration solution was used. 1.8 grams of polyvinyl alchohol were dissolved in 100 ml of hot distilled water and cooled to room temperature. The potassium chloridometer titration solution was prepared by adding 6.4 ml of concentrated nitric acid to 700 ml of distilled water, with good agitation, and subsequently adding 100 ml of glacial acetic acid, 100 ml of the polyvinyl alcohol solution, and finally 100 ml of ethyl alcohol. Acid 'blanks' were coulometrically titrated by the generation of silver ions at the chloridometer HIGH setting. The above procedure was repeated except this time 0.1 ml of 0.2 M sodium tetraphenylboron solution plus 0.1 ml of 0.1 M potassium nitrate solution was added to an empty chloridometer vial and 2 minute reaction time was allowed before adding the 4 ml of acid reagent. The difference between the digital readout in the two series represents the potassium content of the second system. (Mortland-Battelle)
W74-05450

NOVEL METHOD FOR SAMPLING OIL SPILLS AND FOR MEASURING INFRARED SPECTRA OF OIL SAMPLES,
Rhode Island Univ., Kingston. Dept. of Chemistry.
C. W. Brown, P. F. Lynch, and M. Ahmadjian.
Analytical Chemistry, Vol 46, No 1, p 183-184, January 1974. 3 fig, 1 ref.

Descriptors: *Oil spills, *Sampling, Methodology, Separation techniques, *Pollutant identification, *Spectrophotometry.
Identifiers: *Infrared spectra, *Oil fingerprinting, Oil characterization, Infrared spectrophotometry.

A method is described for measuring infrared spectra of oil, which also separates water from the samples. Samples are collected by dipping Al foil into water containing the oil or by smearing the oil on Al foil. The oil adheres to the foil, whereas the water is repelled and will eventually drain off. In this way, most of the water is eliminated from the samples. The foil also serves as an excellent 'sample cell' for oil samples. To eliminate the need for removing the oil from the foil after the water drains off, the spectrum can be measured by replacing one of the plane (flat) mirrors in the sample optical path with the Al foil. All of the spectra were recorded on a Perkin-Elmer Model 521 infrared spectrometer. To obtain a spectrum of an oil sample on Al foil, the foil is placed on the backing plate with its shiny surface toward the light beam - i.e., the foil is used as a reflector surface replacing mirror M2. All mirrors including the Al plate (at M2) are adjusted in the prescribed manner to give a maximum transmitted signal at 2000/cm (a frequency at which the oil does not absorb), and a spectrum is recorded in the usual manner. (Mortland-Battelle)
W74-05451

THE DETERMINATION OF A STABILITY CONSTANT FOR THE AQUEOUS COMPLEX ZN(OH)2 USING ANODIC STRIPPING VOLTAMMETRY,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
W. L. Bradford.
Limnology and Oceanography, Vol 18, No 5, p 757-762, September 1973. 1 fig, 3 tab, 19 ref.

Descriptors: *Zinc, Mathematical studies, Anions, Sodium chloride, Aqueous solutions, Electrodes, Hydrogen ion concentration, Methodology, *Heavy metals, *Volumetric analysis.
Identifiers: *Stability constants, *Anodic stripping voltammetry, Stripping current, Zinc hydroxide, Ion selective electrodes, Metal complexes.

The shift in the potential of the zinc stripping current maximum observed in anodic stripping voltammetry is related to the free energy of the reaction between ionic zinc and a complexing anion. The model was tested using the zinc hydroxyl system; the agreement with experimental results was excellent. The findings suggest the existence of the aqueous complex, Zn(OH)2, which has been reported only once before. The stability constant calculated here is in good agreement with the single published value. As an experimental technique, this has the advantages of avoiding dependence on a solid phase and of making measurements at concentrations similar to those in natural waters. It could be valuable in the study of zinc, cadmium, and lead complexes. The technique can thus be applied only to those complexes whose formation rates are both very fast and faster than those of different order complexes occurring in the test solution. (Mortland-Battelle)
W74-05455

TEMPORAL AND DEPTH STUDY OF ALKALINE EARTH CHLORINITY RATIOS IN SEAWATER AT A SINGLE STATION SOUTH OF PUERTO RICO,
Puerto Rico Univ., Mayaguez. Dept. of Marine Sciences.
For primary bibliographic entry see Field 5B.
W74-05457

THE PERSISTENCE AND MOVEMENT OF PICLORAM AND 2,4,5-T IN SOILS,
North Carolina State Univ., Raleigh. Pesticide Residue Research Lab.
For primary bibliographic entry see Field 5B.
W74-05459

A USEFUL SPRAY REAGENT TO DIFFERENTIATE COMMON PHENOLIC COMPOUNDS ON THIN-LAYER PLATES AND PAPER CHROMATOGRAMS,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Genetics Lab.
B. H. Somaroo, M. L. Thakur, and W. F. Grant.
Journal of Chromatography, Vol 87, No 1, p 290-293, December 5, 1973. 1 tab, 9 ref.

Descriptors: *Phenols, *Pollutant identification, *Color reactions, Chemical analysis, Organic compounds, Chemical reactions, Ammonia, Color, *Chromatography.
Identifiers: *Thin layer chromatography, *Chromogenic reagents, *Paper chromatography, 2-Aminoethyl diphenylboric acid ester, Aromatic hydrocarbons, Anthocyanidins, Flavonols,

Flavones, Glycoflavones, Hydroxycinnamic acid, Methoxycinnamic acid, Diazotized p-nitroaniline, Aluminum chloride, Sodium carbonate.

2-Aminoethyl diphenylboric acid ester (AEDBE) has been found to be quite useful in the detection of phenolic compounds being analyzed by thin-layer and paper chromatography. Both AEDBE and 5 percent AlCl3, can be used to differentiate certain phenolics (anthocyanidins). Diazotized p-nitroaniline (DPN), which has been largely used to characterize phenolic acids, is also useful spray reagent to separate some of the common flavonols. AEDBE is extremely useful to differentiate some of the common phenolic compounds belonging to the anthocyanidin, flavonol, flavone and hydroxycinnamic acid groups. (Holoman-Battelle)
W74-05460

EFFECTS OF PH AND TEMPERATURE ON THE FATTY ACID COMPOSITION OF BACILLUS ACIDOCALDARIUS,
Consiglio Nazionale delle Ricarche, Naples (Italy). Laboratorio di Chimica e Fisica di Molecole di Interesse Biologico.
For primary bibliographic entry see Field 5C.
W74-05461

INTERFERENCE OF NON-HYDROCARBONS IN OIL-IN-WATER DETERMINATION,
Koninklijke/Shell-Laboratorium, Amsterdam (Netherlands).
A. L. Bridie, J. Bos, and S. Herzberg.
Journal of the Institute of Petroleum, Vol. 59, No. 570, p 263-267, November 1973. 2 fig, 6 tab, 3 ref.

Descriptors: *Water analysis, *Separation techniques, *Gas chromatography, *Oily water, *Organic matter, Solvent extractions, Adsorption, Oxidation, Oil pollution, Oil-water interfaces.
Identifiers: Sample preparation, Chemical interference, *Photooxidation, CONCAWE's method, Organic solvents, Kerosene, Accuracy, Chromatograms, Aromatic hydrocarbons.

To accurately measure the amount of oil in water, it is necessary to separate non-hydrocarbons from hydrocarbon material in the samples. Several points were studied toward the development of a satisfactory separation procedure: the formation of oxidation products of mineral oil components in water; the extraction of such oxidation products along with the hydrocarbons and the effect of the solvent (n-pentane, benzene, chloroform or carbon tetrachloride) on the extraction; and the removal of the polar or polarizable products from an extract by means of adsorption on Florisil. Samples were analyzed by gas chromatography. The following was concluded from the studies: (1) All current solvents extract the same amount of hydrocarbon compounds from a (waste) water sample. n-Pentane extracts the smallest amount of oxidation products (non-hydrocarbons). (2) Florisil properly removes the relevant non-hydrocarbons from an n-pentane extract. A disadvantage of this solvent is that some 10-25 percent of the aromatic hydrocarbons are also removed. (3) Solvents that are more polar than n-pentane extract more non-hydrocarbon material from a water sample and are less susceptible to a treatment with Florisil. (4) A suitable procedure is to shake 10 ml n-pentane extract with 1 g of 30/60 mesh Florisil for two or three minutes. (5) Apart from biochemical oxidation (photo)-chemical oxidation may produce far more oxidation products of mineral oil components and within a shorter period of time than is sometimes assumed. (6) For the determination of oil dissolved in (waste) water CONCAWE's method IIIB is recommended. (Little-Battelle)
W74-05462

INOSITOL POLYPHOSPHATES IN ACTIVATED SLUDGE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
For primary bibliographic entry see Field 5B.
W74-05467

THE DETERMINATION OF BORON IN SOLUTION TO SUB-P.P.B. CONCENTRATIONS BY HOLLOW-CATHODE EMISSION,
Virginia Univ., Charlottesville. Dept. of Chemistry.
E. H. Daughtrey, and W. W. Harrison.
Analytica Chimica Acta, Vol 67, No 2, p 253-258, December 1973. 4 fig, 17 ref.

Descriptors: *Boron, *Aqueous solutions, Water analysis, Trace elements, *Spectroscopy.
Identifiers: *Detection limits, *Hollow cathode emission, Emission spectroscopy.

Sub-ppb concentrations of boron in solution were determined by the use of a hollow-cathode emission source for the analysis of cathode surface film deposited from the solution. Solutions were prepared by dissolving boric acid or sodium tetraborate in distilled, deionized water. A Glomax demountable hollow-cathode lamp operating in the flow mode, was used with two modifications. A gas port modification and a replacement of the constricted flow concentric tubing (serving as both cooling water source and drain to the heat exchange block) with a Swagelok Tee-joint fitting and a short length of thin wall stainless steel tubing joined to the heat exchange block by a machine fitting. Copper proved to be an excellent cathode material, owing to low background and ease of boron sputtering from the surface. Clean-up of the cathode was a critical factor in reproducibility of hollow-cathode emission. The best signal-to-background intensity was at 0.7 torr pressure of argon, measured on the exit side of the tube. The lower limit of atomic emission detection is about 10 pg, although the sensitivity could be improved by multiple sample applications. The boron atomic line emission is 200 times as intense as boron oxide band emission. (Little-Battelle)
W74-05468

THE EXTRACTION-SPECTROPHOTOMETRIC DETERMINATION OF CHROMIUM (III) WITH 4-(2-PYRIDYLAZO)-RESORCINOL,
Hokkaido Univ., Sapporo (Japan). Lab. of Analytical Chemistry.
T. Yotsuyanagi, Y. Takeda, R. Yamashita, and K. Aomura.
Analytica Chimica Acta, Vol 67, No 2, p 297-306, December 1973. 8 fig, 21 ref.

Descriptors: *Separation techniques, *Chromium, *Aqueous solutions, *Spectrophotometry, Heavy metals, Water analysis, Absorption, Color, *Solvent extractions.
Identifiers: Chemical interference, Sensitivity, Sample preparation, Metal chelates, *Resorcinols.

The extraction-spectrophotometric determination of chromium (III) with 4-(2-pyridylazo)-resorcinol (PAR) is described. PAR(H2R) forms a 1:3 complex with chromium (III) in a boiling acetate buffer solution at pH 5. The complex forms an ion-association compound with tetradecyldimethylbenzylammonium ion (TDBA):Cr(R)(HR)2(minus)-TDBA which can be extracted into chloroform, the molar absorptivity being 47,000 at 540 nm. If EDTA is added as a masking agent after the Cr(HR)3 has been formed, only iron, cobalt and nickel interfere seriously, and the method can be made specific for chromium by a preliminary extraction of these metals with cupferron. The sensitivity of the method is seven times higher than that of the diphenylcarbazide method. (Little-Battelle)
W74-05470

THE SPECTROPHOTOMETRY AND SOLVENT-EXTRACTION BEHAVIOUR OF IRON(III), VANADIUM(IV AND V) AND TITANIUM(IV) CHELATES OF 1-(O-CARBOXYPHENYL)-3 HYDROXY-3-METHYLTRIAZENE,
Jadavpur Univ., Calcutta (India). Dept. of Chemistry.
A. K. Majumdar, B. C. Bhattacharyya, and B. C. Roy.
Analytica Chimica Acta, Vol 67, No 2, p 307-315 December 1973. 4 fig, 5 ref.

Descriptors: *Spectrophotometry, *Solvent extractions, *Iron, *Titanium, Separation techniques, Cations, Anions, Heavy metals, Aqueous solutions, Water analysis.
Identifiers: *Metal chelates, *Vanadium, Chloroform, Sulfuric acid, Tartaric acid, Chemical interference.

1-(o-Carboxyphenyl)-3-hydroxy-3-methyltriazene is proposed as an excellent reagent for the spectrophotometric determination of iron(III) and titanium(IV), and also for the separation of titanium from a large quantity of iron as well as other cations and anions. Iron(III) forms an anionic violet 1:2 complex at pH 4.0-9.4, and a cationic green 1:1 complex at pH 1.5-2.0, with absorption maxima at 570 nm and 660 nm, respectively. The violet complex is quantitatively extracted in chloroform containing n-octylamine at pH 3.0-9.0. The green and the violet iron(III) complexes obey Beer's law, the respective optimal ranges between 8.9-35.8 and 3.9-11.2 ppm. The yellow titanium chelate extracted into chloroform (absorption maximum at 410 nm) between pH 1.0 and 3.5, can be reextracted into concentrated sulphuric acid and a violet color being produced with absorption maximum at 530 nm. Beer's law is obeyed in the ranges 0.8-5.7 ppm for the titanium complex in chloroform and 3.4-19.2 ppm when extracted in concentrated sulphuric acid. Interferences from diverse ions are not severe. Procedures for the separation and determination of titanium in the presence of a large quantity of iron are given. The isolation of the iron(III) and vanadium(IV and V) complexes, and their properties, are described. (Mortland-Battelle)
W74-05471

SYNERGIC SOLVENT EXTRACTION OF DIVALENT CATIONS WITH DECAFLUOROHEPTANEDIONE AND DI-N-BUTYLSULFOXIDE,
Hewlett-Packard Co., Avondale, Pa. Avondale Div.
C. A. Burgett.
Analytica Chimica Acta, Vol 67, No 2, p 325-330 December 1973. 3 fig, 1 tab, 11 ref.

Descriptors: *Solvent extractions, *Iron, *Cobalt, *Nickel, *Lead, Copper, Hydrogen ion concentration, Stability, Cations, Separation techniques, *Volumetric analysis, Heavy metals, Aqueous solutions, Water analysis, Efficiencies.
Identifiers: Equilibration time, Stoichiometry, Chemical interference.

The synergic solvent extaction of iron(II), cobalt(II), nickel(II) and lead(II) with 1,1,1,2,2,6,6,7,7,7-decafluoro-3,5-heptanedione (H(FHD)) and di-n-butylsulfoxide (DBSO) into cyclohexane is described. The optimal pH, equilibration time, stoichiometry and stability of the extracted species were studied. Approximately 0.01 M solutions of the cations were prepared by dissolving the appropriate salt in deionized water. The stock solutions were then standardized by titration with EDTA, NAS serving as the indicator. Exactly 1.00 ml of the 0.01 M metal solutions was pipeted into a 15-ml screw-cap glass test tube. Then 1.00 ml of the appropriate buffer solution was added to each test tube. To each test tube 1.00 ml of a cyclohexane solution of DBSO and 1.00 ml of a cyclohexane solution of H(FHD) was added. The mixture was shaken for 1 h and the phases were allowed to separate. The equilibrium pH of the aqueous phase was measured. A 1.00-ml aliquot of the aqueous phase was removed for determination of the amount of unextracted metal

/ titration with EDTA as described above. For all the metals studied, highly efficient extraction curred at equilibrium pH values of 4.5-6.0. No trimental effect from the presence of chloride, etate, sodium or acetic acid was observed. The traction was found to be quantitative after uilibration times of 15 min or more. All of the tracted species, except the iron(II) complex, ere stable for a period of two weeks and could be ried at 100C. The iron(II) complex was stable ter one day at low pH, but at pH 6.0 the complex as stable for one week. (Mortland-Battelle)
74-05472

HE APPLICATION OF PHOTO-OXIDATION O THE DETERMINATION OF STABLE OBALT IN SEA WATER,
linistry of Agriculture, Fisheries and Food, owestoft (England).
. R. Harvey, and J. W. R. Dutton.
nalytica Chimica Acta, Vol 67, No 2, p 377-385, ecember 1973. 4 fig, 2 tab, 8 ref.

escriptors: *Cobalt, *Sea water, *Water analys, Methodology, Chemical analysis, Pollutant lentification, Trace elements, Heavy metals, Polarographic analysis, Chemical precipitation, urface waters.
dentifiers: *Photooxidation, *Pulse polarogaphy, Preconcentration, Detection limits, Trace vels, Sample preparation, Manganese dioxide, hemical recovery, Chemical concentration.

. method is described for the determination of anogram quantities of cobalt in a 1-1 sample of eawater after preconcentration with sub-milliram quantities of manganese dioxide formed by ie oxidation of manganese(II) in a photochemical eactor. The cobalt is measured by pulse polarogaphy as the dimethylglyoximate after dissolving ie manganese dioxide deposit adhering to the uartz jacket surrounding the ultraviolet lamp. he detection limit of the method is ca. 0.6 ng Co/l. Holoman-Battelle)
W74-05473

URFACTANT-SELECTIVE ELECTRODES. ART I. AN IMPROVED LIQUID ION-XCHANGER,
Jnilever Ltd., Port Sunlight (England). Unilever esearch Lab.
. J. Birch, and D. E. Clarke.
nalytica Chimica Acta, Vol 67, No 2, p 387-393, ecember 1973. 3 fig, 1 tab, 5 ref.

escriptors: Fabrication, Solubility, *Surfactants, nions, *Ion exchange, *Electrodes, *Sulfur compounds, *Sulfonates.
dentifiers: Dodecylsulfate electrodes, *Anionic urfactants, *Surfactant selective electrodes, iquid ion exchanger, Ionic interference, n-Alkyl ulfates, Ion selective electrodes, Dodecyl sodium ulfate, Sodium tetradecyl sulfate, Sodium odecylbenzenesulfonate, Sodium dodecylsulonate, Sodium dodecenylsulfonate, Sodium odecylethersulfate, Sodium dodecanoate, Marn A, Alkylate 230 sulfate.

n improved electrode selective to the dodecylulphate anion is described, which has no apparent ffect on micellar properties. Electrodes selective o a variety of surfactant types have been prepared nd the manufacture of electrodes specific to sinle alkyl chain length surfactants is discussed. An xample is given of their use in the study of the recipitation of commercial surfactants. Holoman-Battelle)
V74-05474

GOLD TWIN-ELECTRODES IN THIN-LAYER ELECTROCHEMISTRY,
Vichita State Univ., Kansas. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
V74-05475

NEUTRON IRRADIATION OF MERCURY IN POLYETHYLENE CONTAINERS,
Naval Undersea Center, San Diego, Calif.
H. V. Weiss, and K. Chew.
Analytical Chimica Acta, Vol 67, No 2, p 444-447, December 1973. 2 tab, 3 ref.

Descriptors: *Mercury, *Irradiation, *Acidity, *Plastics, Adsorption, Neutron activation analysis, Aqueous solutions, Chemical analysis, Time, Heavy metals, *Radioactivity, Trace elements.
Identifiers: Chemical loss, Volatilization, Hg-197, Data interpretation, Cd-115-In-115.

When mercury is neutron-irradiated in polyethylene containers, its behavior is dependent on acidity of the solution. Mercury was irradiated for 10 and 60 min in solutions of different nitric acid concentration. For each of the time periods, the unacidified solutions contained less Hg-197 than their acidified counterparts; this difference was more pronounced for the 60-min irradiated samples. Comparison of activity levels for solutions irradiated for the two time intervals indicate the counting rates scale by a factor of six for the acidified solutions but not for water. Counting data are given for irradiation vials directly counted several days after neutron activation of cadmium and mercury solutions of varying acidity. With cadmium the counting rate decreased regularly as a function of nitric acid concentration, while with mercury the activity level in the unacidified sample was substantially less than for the samples in nitric acid solution. The relationship between the comparable ntric acid solutions of mercury parallels that of cadmium. From these results the conclusion is drawn that mercury in acidified solution is not lost during irradiation, at least not over the interval 10-60 min. But in the absence of acid, substantial loss is encountered. The loss appears to occur by two routes: adsorption and volatilization. (Holoman-Battelle)
W74-05476

A SIMULTANEOUS DETERMINATION OF ZINC AND CADMIUM,
Gustavus Adolphus Coll., St. Peter, Minn. Dept. of Chemistry.
R. E. Jensen, and M. Kaehler.
Analytica Chimica Acta, Vol 67, No 2, p 465-468, December 1973. 1 tab, 2 ref.

Descriptors: *Zinc, *Cadmium, *Aqueous solutions, Methodology, *Chemical analysis, *Pollutant identification, Stability, Trace elements, Cations, Heavy metals, Chelation, Solvent extractions, *Spectrophotometry.
Identifiers: Picolinealdehyde-2-quinolylhydrazone, *Atomic absorption spectrophotometry, Metal complexes, Extraction efficiency, Sensitivity, Detection limits, Ionic interference, Complexation.

This particular method for the simultaneous determination of zinc and cadmium involves using picolinealdehyde-2-quinolylhydrazone (PAQH) as the complexing agent, extracting from aqueous solution into chloroform, and completing the measurement by atomic absorption spectrophotometry. The most efficient complexation and extraction were obtained at pH 8.5. A study of excess of reagent on the zinc(II)-PAQH system showed that a fifteen-fold excess of ligand was sufficient for maximal complex formation. A twenty-fold excess of PAQH was necessary for maximal cadmium(II)-PAQH complex formation. Three 5-ml aliquots provided the greatest extraction efficiency. Solutions of both complexes were stable for a least one week. The Zn(II)-PAQH complex was found to obey Beer's law over a concentration range of 0.065-1.30 ppm. The sensitivity of measurement was calculated as 17.7 ppb, and the detection limit 3.13 ppb. A similar study of the Zn(II) complex absorbance over the same concentration range in aqueous solution gave the comparable sensitivity and detection limit as 27.8 ppb and 9.34 ppb, respectively. The Cd(II)-PAQH complex obeyed Beer's law over the same concentration range 0.113-2.26 ppm Cd(II). The sensitivity level was determined as 22.6 ppb, and the detection limit was 1.7 ppb. In comparable aqueous solutions, the sensitivity was 60.3 ppb, and the detection limit 10.5 ppb. Although it has been shown that there is no mutual interference between the zinc and cadmium complex systems, there are interferences from other cations. These interfering ions consume the reagent and must be removed before the analysis for zinc and cadmium. (Holoman-Battelle)
W74-05477

PHOTOMETRIC DETERMINATION OF DIPHENYLAMINE WITH CERIUM(IV) SULPHATE,
Andhra Univ., Waltair (India). Dept. of Chemistry.
M. Gandikota, and G. G. Rao.
Analytica Chimica Acta, Vol 67, No 2, p 469-472, December 1973. 1 fig, 2 tab, 10 ref.

Descriptors: *Pollutant identification, *Chemical analysis, *Spectrophotometry, Stability, Photometry, Pollutants, Methodology, Color reactions, Oxidation.
Identifiers: *Cerium sulfate, *Diphenylamine, Accuracy, Chemical interference, Aniline, Methanol, Ethanol, Sulfuric acid, Chemical concentration.

The conditions are established for the quantitative oxidation of diphenylamine with cerium(IV) sulfate to diphenylamine blue and its photometric determination. The results obtained from studying the effect of Cs(IV) concentration showed that with molar ratios of diphenylamine to Ce(IV) varying from 1:2.5 to 1:8 the diphenylamine blue is not destroyed even by a large excess of the oxidant over and above that required for the formation of the blue color. The stability of the blue color increases with increasing concentration of sulphuric acid, being about 5-6 min in 4M sulphuric acid, about 6-7 min in 5M sulphuric acid and about 9-10 min in 6M sulphuric acid. Compared with the available procedures this has the advantages of speed, fewer reagents and freedom from interference from aniline (0.08 nmoles), methanol (59 moles), and ethanol (17 nmoles). (Holoman-Battelle)
W74-05478

ANIONIC ELECTROPHORETIC PATTERN OF FIVE RUTHENIUM SALTS IN FRESH AND SEA WATER: EFFECTS OF AGING AND DILUTION,
Centre d'Etude de l'Energie Nucleaire, Mol (Belgium). Laboratoires.
J. Vos, S. Van Puymbroeck, and O. Van Der Borght.
Analytica Chimica Acta, Vol 67, No 2, p 480-485, December 1973. 2 fig, 16 ref.

Descriptors: *Waste dilution, Freshwater, Sea water, *Aging(Physical), Aqueous solutions, *Chemical analysis, *Salts, *Nuclear wastes, *Electrophoresis, Water analysis, Heavy metals, Methodology.
Identifiers: *Anionic electrophoresis, *Ruthenium salts, Dilution, Ruthenium nitrosylhydroxynitrite, Ruthenium nitrosylchloride, Ruthenium chloride, Ruthenium nitrosylhydroxide, Ruthenium nitrosylnitrate, Ru-106.

The presence of ruthenium species in the wastes of nuclear fuel reprocessing plants has led to considerable interest in the very complex behavior of ruthenium. In this study, five ruthenium salts (nitrosylhydroxynitrite, nitrosylchloride, chloride, nitrosylnitrate complexes, and nitrosylhydroxide) were studied for influence of dilution and aging, by means of high-voltage electrophoresis: (1) in concentrated aqueous solutions; (2) after further dilution with freshwater; and (3) after further dilution with seawater. This study provides further evidence of the complexity of ruthenium in aqueous neutral solutions and emphasizes the following

points, which are important for waste release management. (1) The behavior of the ruthenium salts is, in general, similar in filtered seawater and freshwater, except for fresh nitrosylnitrate solutions. (2) Aging is still incomplete after one week except for the ruthenium-nitrosylchloride complexes where there are no such effects. (3) Aging of the ruthenium solutions results generally in a decrease of the number of complexes, a decrease of their mobility and a severe decrease or total disappearance of the resolution of the separation pattern. (4) Ten-fold dilution had no important influence except for the fresh ruthenium chloride and the 7-day old nitrosylnitrate. (5) Nitrosylnitrite, and especially the aged solutions, contains an exceptionally low amount of Ru-106 adsorbed on the staring line. (6) The characteristics of nitrosylhydroxide solutions in fresh and seawater, are similar to the other salts. The freshly prepared solutions contain about 30 percent of negative complexes with comparatively high mobility in the electric field. (7) The number of species detected by high-voltage electrophoresis in phosphate buffer ranges up to 13 clearly defined bands and 2 vaguer tailings for freshly prepared concentrated neutral ruthenium-chloride complexes. Each salt gives a different electrophoretic separation picture, although complexes at 20-20.5 cm from the starting line appear in most solutions. (Holoman-Battelle)
W74-05479

GAS CHROMATOGRAPHY OF SUBSTITUTED PHENYLUREAS BY FLASH-HEATER METHYLATION WITH TRIMETHYLANILINIUM HYDROXIDE,
Agricultural Research Service, Fargo, N. Dak.
F. S. Tanaka, and R. G. Wien.
Journal of Chromatography, Vol 87, No 1, p 85-93, December 5, 1973. 2 fig, 3 tab, 11 ref.

Descriptors: *Herbicides, *Aromatic compounds, Monuron, *Urea pesticides, *Gas chromatography, Pollutant identification.
Identifiers: *Phenylureas, Gas liquid chromatography, *Methylation(Flash heater), Diuron, Fluometuron, Fenuron, Linuron, Metabromuron, Neburon, Methelutes.

A simple method for the methylation of substituted phenylureas with trimethylanilinium hydroxide (methelute) is described. The methylation reaction product was the 3-N-methyl analog of the substituted phenylurea. Seven phenylureas (fluometuron, fenuron, monuron, metobromuron, linuron, diuron, and neburon) with a variety of structures were analyzed using six different chromatographic columns. The gas chromatographic response was linear with increased concentration of the 3-N-methyl analogs of monuron and diuron for both synthetic standards and flash-heater reaction products. Maximum methylation was obtained when the ratio of methylating reagent to phenylurea was approximately 2.5:1. This methylation technique provides for rapid qualitative and quantitative chromatography of substituted phenylureas without side-chain decomposition. (Mortland-Battelle)
W74-05480

SEPARATION AND ANALYSIS OF MIXTURES OF CATIONIC SURFACE-ACTIVE AGENTS BY SALTING-OUT CHROMATOGRAPHY,
Kao Soap Co., Wakayama (Japan). Industrial Research Lab.
For primary bibliographic entry see Field 2K.
W74-05481

PERHALOBENZENESULFINATES AS REAGENTS IN THE DETERMINATION OF INORGANIC MERCURY IN VARIOUS MEDIA BY GAS-LIQUID CHROMATOGRAPHY,
North Carolina Univ., Chapel Hill. School of Medicine.
P. Mushak, F. E. Tibbetts, III, P. Zarnegar, and G. B. Fisher.
Journal of Chromatography, Vol 87, No 1, p 215-226, December 5, 1973. 6 fig, 1 tab, 12 ref.

Descriptors: *Mercury, Aqueous solutions, Urine, *Gas chromatography, Water analysis, Heavy metals, *Pollutant identification.
Identifiers: Gas liquid chromatography, *Biological samples, Serum, Perhalophenyl mercury, Arylating agents, Aryl mercurials, *Organomercury compounds, Electron capture detector, Detection limits, Precision, Chemical Recovery.

Inorganic mercury and organomercurials present in water, urine and serum are evaluated by gas-liquid chromatography and the use of perhalobenzenesulfinates which react with inorganic mercury to yield a perhalophenyl mercury. Best results are obtained with lithium pentafluorobenzenesulfinate as arylating agent for inorganic mercury. Recovery and precision data include: water, 70.5 percent (6.8); urine, 81.4 (10.5); serum, 51.0 (9.4). Lower detection limit of inorganic mercury, as the pentafluorophenyl analyte, is 20 ng of meliliter of sample. Optimal chromatographic results were obtained with 10 percent Dexsil-300 on Anakrom SD, 70-80 mesh, and Durapak Carbowax 400 on Porasil F. (Mortland-Battelle)
W74-05482

NITROGEN FIXATION IN A SUBARCTIC MIRE,
Kungliga Lantbrushogskolan, Uppsala (Sweden).
For primary bibliographic entry see Field 5B.
W74-05489

METAL COORDINATION COMPOUNDS OF THIABENDAZOLE,
Western Washington Research and Extension Center, Puyallup.
V. L. Miller, C. J. Gould, E. Csonka, and R. L. Jensen.
Journal of Agricultural and Food Chemistry, Vol 21, No 5, p 931-932, September/October 1973. 1 tab, 12 ref.

Descriptors: *Fungicides, *Aqueous solutions, Copper, Zinc, Cobalt, Nickel, Solubility, Synthesis, Biological properties, Bioassay, Fungi, Hydrogen ion concentration, Water quality, Spectroscopy, Pesticide toxicity, *Metals.
Identifiers: *Thiabendazole, Fusarium, Penicillium, 2-(4'-Thiazolyl)benzimidazole, Organometallics.

Several metal coordination compounds of the fungicide thiabendazole, 2-(4'-thiazolyl)benzimidazole (TBZ), were prepared and the solubilities in water and the pH of the solutions were determined. Fungicidal activity of the compounds was equal to that of TBZ against an isolate of Penicillium and of Fusarium. For analysis the compounds were hydrolyzed in 6 N HCl at steam bath temperature for 1-2 hr. TBZ was determined by absorbance of an aliquot of the digest in 0.1 N HCl measured at 302 nm. For chloride analysis, the sample was dissolved in dilute nitric acid and titrated. The approximate water solubility of the compounds was determined by machine shaking of excess compound with water at room tempe at least 4 hr. The water solubility of TBZ was determined to be 1-2 micrograms/ml. The ZN (TBZ)2C14 and CoTBZ(GLU)2 were the most soluble. The solubility of TBZHCl as TBZ was 18.2 mg/ml, and the pH was 3.3. The materials to be bioassayed were dissolved in water and the concentration was determined by spectroscopy at 302 nm in 0.1 N HCl. The control level of active ingredient of commercially formulated TBZ determined by this bioassay was 11 micrograms/ml for Penicillium and 92 micrograms/ml for Fusarium. The activity of the synthetic materials may reflect water solubility rather than greater potency. (Mortland-Battelle)
W74-05490

ADSORPTION OF HG(II) BY HYDROUS MA GANESE OXIDES,
University of Southern California, Los Angel Environmental Engineering Program.
R. A. Lockwood, and K. Y. Chen.
Environmental Science and Technology, Vol No 11, p 1028-1034, November 1973. 10 fig, 13 r

Descriptors: *Mercury, *Adsorption, Mangane *Aqueous solutions, Water pollution contr Sodium chloride, Hydrogen ion concentrati Waste water treatment, Freshwater, Broack water, Spectrophotometry, Chlorides.
Identifiers: *Manganese oxide, Scavengi Transport, Ionic strength, Desorption Pollut Removal.

The adsorption of Hg(II) by hydrous mangan oxides suspended in solutions with wide ranges pH, chloride concentration, and ionic strength w studied to evaluate the possible importance manganese oxides in mercury scavenging in na ral waters. Manganese dioxide and possibly otl oxides were precipitated with the addition MnS04 solution to KMn04 solution. Hg(II) was sorbed rapidly when added to aged suspensions Mn02 with low ionic strength. 0.6 M Na repressed adsorption below pH 9, but not abo pH 10. Apparently 0.6 M NaC104 chang equilibrium values only slightly, but adsorpti rates were many ornitude lower, particula above pH 8. It is concluded that Mn02 may be i portant as a mercury scavenger in fresh brackish water, either in the natural environm or in the treatment of water and wastewater. C clusions about Hg in manganese nodules in ocean are not justified because of the large trapolation required between the data present and the actual ocean concentrations of Hg(II). the other hand, in freshwater lakes and strean and possibly in soils, amorphous manganese ides would be active scavengers of mercury. T actual presence of mercury in manganese nodu from deep ocean deposits may be accounted for other mechanisms not studied in this wo (Mortland-Battelle)
W74-05491

CHEMICAL CONFIRMATION OF BI ISOMERS: COMPARISON OF ALKALI REACTIONS IN SOLUTION AND BY G CHROMATOGRAPHIC PRE-COLUMN,
Department of Agriculture, Ottawa (Ontari Plant Products Div.
W. P. Cochrane, and R. B. Maybury.
Journal of the Association of Official Analyti Chemists, Vol 56, No 6, p 1324-1329, Novemt 1973. 4 fig, 2 tab, 23 ref.

Descriptors: *Gas chromatography, *Pollut identification, *Pesticide residues, Separati techniques, Foods, Cereal crops, Feeds.
Identifiers: *BHC isomers, *Lindane, Sodi methoxide, Trichlorobenzene, Biological sampl Cleanup, Isomers, Electron capture detector, kaline precolumn method, Gas liquid chromat raphy, Sample preparation, Fat, Meat.

A rapid precedure that involves treatment w sodium methoxide (NaOMe) solution is describ for the qualitative confirmation of lindane (a other BHC isomers) residues in cereal, anim feed, meat, and fat samples. Losses encounter in the evaporation and partition steps discussed. Optimum electron capture GLC con tions, both programmed and isothermal, for t separation of the 1,3,5-, 1,2,4-, and 1,2 trichlorobenzene products are given. Comparis of the NaOMe solution reaction with an alkali pre-column technique revealed that the lat saved time in the analysis of cereal, animal fee and cheese extracts. The alkaline pre-colur method did not elimenate interferences in sor meat and fat samples; the NaOMe solution rea tion does eliminate these interferences. A low level of 0.01 ppm lindane in a 10-g sample can confirmed by the procedures describe (Mortland-Battelle)

W74-05494

GAS-LIQUID CHROMATOGRAPHIC DETERMINATION OF ROTENONE AND DEGUELIN IN PLANT EXTRACTS AND COMMERCIAL INSECTICIDES,
Northern Regional Research Lab., Ill.
N. E. Delfel.
Journal of the Association of Official Analytical Chemists, Vol 56, No 6, p 1343-1349, November 1973. 2 fig, 3 tab, 16 ref.

Descriptors: *Insecticides, Vegetation, Leaves, Separation techniques, Gravimetric analysis, *Gas chromatography, *Pollutant identification.
Identifiers: Gas liquid chromatography, *Rotenone, *Deguelin, Flame ionization detector, Derris elliptica, Rotenolone, Lonchocarpus nicou, Tephrosia, vogelii, Thin layer densitometry, Reproducibility.

Retention times on 3 percent methyl silicone in glass columns at 160C were 0.85 and 1.39, respectively, for deguelin and stigmasterol acetate, the internal standard; and flame ionization detector responses were 1.00 and 1.47, respectively, compared to rotenone as 1.00 in both cases. Rotenolone, when present, interfered with the determination of deguelin. Rotenoid extracts from Derris elliptica and Lonchocarpus nicou roots lacked other interfering materials. Tephrosia vogelii leaflets contained fat-soluble contaminants that were minimized by using acetonitrile for extraction and by subsequent partitioning with hexane. When the GLC assay was applied to commercial samples, rotenone results were comparable to label values in 2 samples and rotenoid oxidation products were detected in 2 others. The precision of GLC was plus or minus 4.1 percent and the results agreed with those by thin layer densitometry (TLD) within 2.1 percent for rotenone and 2.9 percent for deguelin. A monor improvement of TLD for analysis of T. vogelii extracts is also described. In conclusion, GLC is quicker than TLD and yields more reproducible results (4 percent vs. 8 percent, respectively). The 2 methods gave comparable results on D. elliptica and L. nicou, and GLC avoided most of the bias for the TLD deguelin value in T. vogelihe GLC method has many positive attributes which favor its being considered as an alternative to the slower, more expensive gravimetric method for rotenone in industrial quality control. (Mortland-Battelle)
W74-05495

SEMIAUTOMATED METHOD FOR MORE PRECISE AND SENSITIVE DETERMINATION OF NONPOLAR ANTICHOLINESTERASE INSECTICIDES WITH TECHNICON MODULES,
Ciba-Geigy Ltd., Basel (Switzerland). Agrochemical Div.
G. Voss.
Journal of the Association of Official Analytical Chemists, Vol 56, No 6, p 1506-1507, November 1973. 5 fig, 6 ref.

Descriptors: *Insecticides, *Automation, *Gas chromatography, *Methodology, Adsorption, Flow, *Pollutant identification, Organophosphorus pesticides.
Identifiers: *Anticholinesterases, AutoAnalyzer, Chlorfenvinphos, Cholinesterase, Sensitivity, Reproducibility.

Problems of adsorption of relatively nonpolar anticholinesterase insecticides to the pump tubing of automated flow systems have been noted and described by several authors. The problem has now been eliminated by not pumping the sample solutions directly; instead they are more concentrated and are manually injected into a special flowcell-type injection chamber just downstream from the proportioning pump. In the original procedure the insecticide solution (0.8 ml/min) was pumped from the sampler (20 samples/hr, 1 min sample aspiration followed by a wash period of 2 min) and mixed with an equal volume of buffered cholinesterase solution. The altered portion of the manifold, however, in addition to the usual air pump tubing, requires only one pump tube (1.6 ml/min) through which the enzyme working solution (2-fold dilution) flows into an all-glass and one-piece injection cell with a volume of ca 0.8-1.0 ml. The solution passing through the cell is continuously stirred by means of a magnetic flea. Methanolic insecticide solutions are then injected into the cell through a silicone rubber sng a microsyringe. Original AutoAnalyzer recordings obtained with the organophosphate chlorfenvinphos and peacock plasma cholinesterase are presented for both systems. The results demonstrate the advantages of injecting nonpolar compounds into an aqueous flow system. While the injections are performed manually in the present system, the potential for full automation awaits the inclusion of an automated injection sampler, for example, the Hewlett-Packard Model 7670A automatic sampler. (Mortland-Battelle)
W74-05496

ULTRASONIC SOLUBILIZATION TECHNIQUE FOR USE IN COULOMETRY,
Wagner Coll. Science Center, Staten Island, N.Y.
W. P. Ferren, and W. M. Fortinash.
Journal of the Association of Official Analytical Chemists, Vol 56, No 6, p 1514-1515, November 1973. 1 tab, 4 ref.

Descriptors: *Chlorides, *Analytical techniques, *Pesticides, Organic compounds, Methodology.
Identifiers: *Coulometry, *Ultrasonic solubilization, Precision, p-Chlorobenzoic acid.

An ultrasonic solubilization technique has been developed which is useful as a first step in the coulometric determination of the chloride content of crystalline organic compounds such as p-chlorobenzoic acid. p-Chlorobenzoic acid was used as the test compound because it represents a crystalline powder substance requiring very efficient agitation to achieve the necessary intimate contact with the sodium biphenyl reagent. Using p-chlorobenzoic acid as the standard, it was found that adding hydrogen peroxide and evaporating by heat yielded errors as much as -10 percent. The use of ceric ion to destroy hydrogen peroxide prior to coulometric measurements reduced these errors to about -3 percent. Subsequently, the elimination of hydrogen peroxide in favor of a stream of oxygen gas improved the accuracy of the method to the point where the average value of 10 determinations was 22.58 percent chloride compared to the theoretical value of 22.65 percent cride. It was possible to determine 4 micrograms chloride (as present in p-chlorobenzoic acid) with a linear relationship between read-out and chloride content for p-chlorobenzoic acid in the sample range 0.0 to 2.0 mg. The percentage of chloride in p-chlorobenzoic acid was determined with an absolute error of -0.07 percent or a relative error of -0.3 percent. The standard deviation was 0.06, which yields a 95 percent confidence interval of plus or minus 0.04 percent. This confidence interval applies within the limits of detection. (Mortland-Battelle)
W74-05497

EXPERIMENTAL APPROACHES TO LIMNOLOGY - AN OVERVIEW,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. W. Schindler.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1490-1413, October 1973. 1 tab, 26 ref.

Descriptors: *Limnology, *Lakes, *Nutrients, *Methodology, Eutrophication, Carbon, Gas chromatography, Diffusion, Radioactivity techniques, Primary productivity, Bioassay, Model studies, Bicarbonates, Water temperature, Hydrogen ion concentration, Water quality, Volumetric analysis, Plankton, Algae, Chlorophyll, Phosphates, Fertilization, Phosphorus, Carbon, Absorption.
Identifiers: Dissolved inorganic carbon, ATP, Experimental Lakes.

After 4 years of searching for methods to describe and interpret changes in lakes of the Experimental Lakes Area and considerable laboratory work related to critical problems in freshwater nutrient dynamics, several papers describing the work have been prepared. This paper attempts to summarize these individual contributions. One problem encountered was lack of a reliable method for measuring dissolved inorganic carbon. A modified gas chromatographic technique was devised to overcome this shortcoming. A simple method for measuring live microplankton biomass was also needed. This need may be met through ATP measurements, although several possible problem areas must be thoroughly tested. A serious problem still remaining is the estimation of true phosphate concentrations. Standard acid molybdate methods give too high results in most waters and bioassay or Sephadex techniques are time-consuming and require highly experienced personnel. Several problems with various physical methods (diffusion gas exchange, dye diffusion, radon techniques) are also discussed as are those with in situ biological methods. Fallacies in systems modelling approaches to nutrient and productivity studies are pointed out. It is concluded that from a purely scientific point of view, the most important area in limnological research remains the construction and thorough testing of a sound methodology, designed to illuminate ecosystem problems rather than just to describe them. (Mortland-Battelle)
W74-05498

THIN-LAYER CHROMATOGRAPHY OF METAL CHELATES. PART II. AN EXTENDED THEORY AND ITS TESTING ON METAL DITHIZONATES AND METAL DIETHYLDITHIOCARBAMATES,
A. Galik.
Analytica Chimica Acta, Vol 67, No 2, p 357-376, December 1973. 12 fig, 3 tab, 25 ref.

Descriptors: *Aqueous solutions, *Heavy metals, *Mathematical models, Mercury, Copper, Nickel, Cobalt, Lead, Cadmium, Zinc, Iron, Humidity, Temperature, Water analysis, Solvents, Methodology, Equations, *Chromatography.
Identifiers: *Metal Chelates, *Organic solvents, *Thin layer chromatography, Bismuth, Indium, Antimony, Dithizonates, Diethyldithiocarbamates, Sample preparation, Validity.

The extension of an earlier mathematical model attempted to explain the effect of solvent composition a humidity on the thin-layer chromatographic (tlc) behavior of metal pyridylazonaphtholates. The purpose of the study was to make the model capable of predicting more phenomena and to provide a basis for further research leading to a better understanding of the chromatography of metal chelates. Review and study of the model led to the derivation of equations from which it was concluded that the position of the spot of the solute on the chromatogram may be influenced by the choice of the polar component of the solvent mixture, by the concentration of this component in this mixture, and by air humidity and temperature. The validity of these conclusions was shown by studying the tlc behavior of metal (Hg, Bi, Cu, Ni, Co, Pb, Cd, Zn, In, Sb, Fe) dithizonates and diethyldithiocarbamates on Silufol. A comparison of the mobilities of these metal chelates, as well as of those of 8-hydroxyquinoline, salicyladoxime and benzoylacetone, with their extraction constants showed a mutual correlation between these properties. (Little-Battelle)
W74-05500

AN IMPROVED ION-EXCHANGE TECHNIQUE FOR THE CONCENTRATION OF MANGANESE FROM SEA WATER,
Skidaway Inst. of Oceanography, Savannah, Ga.
R. G. Smith, Jr.

Skidaway Institute of Oceanography Annual Progress Report (EPA Project No R-800372), Appendix E, p 236-242, January 1974. 1 tab, 10 ref.

Descriptors: *Chemical analysis, *Manganese, *Sea water, *Ion exchange, Analytical techniques, Flame photometry, Pollutant identification.

In analysis of Mn in seawater, a batch technique is used for the concentration of Mn using Chelex-100. The technique alleviates difficulties in the column technique caused by swelling and contraction properties of the resin. The method yields quantitative recovery with a variation in efficiency of plus or minus 0.6%. (See also W74-05501) (Knapp-USGS)
W74-05506

DETERMINATION OF THE RATE OF TRIPOLY- AND PYRO-PHOSPHATE HYDROLYSIS IN SEDIMENTS,
Missouri Univ., Columbia. Dept. of Agronomy.
R. W. Blanchar, and D. Riego.
Available from National Technical Information Service as PB-229 837 $6.25 in paper copy, $1.45 in microfiche. Missouri Water Resources Center, Columbia, Completion Report, January 1974. 52 p, 18 fig, 2 tab, 34 ref. OWRR A-059-MO(1). 14-01-0001-3825.

Descriptors: *Hydrolysis, *Sediments, *Missouri, Kinetics, *Phosphates, Chemical precipitation, Chemical reactions, Pollutant identification.
Identifiers: *Polyphosphates, *Pyrophosphates.

The rate of hydrolysis of tripolyphosphate (TPP) and pyrophosphate (PP) in sediments was determined. The sediments were collected from Cape Fair, Thomas Hill Lake, Flat Branch Creek, and Maries River. The rate of hydrolysis of TPP and PP was similar to that predicted from first order kinetics. Half lives for the hydrolysis of TPP and PP were 1.6 to 2.6 and 6.7 to 27.4 days, respectively. The influence of temperature, biological activity, and pH on the rate of TPP and PP hydrolysis was investigated using Flat Branch Creek sediment. The rate of TPP and PP hydrolysis increased with increasing temperature. The activation energy was 5415 cal/mole for TPP and 10,412 cal/mole for PP. TPP and PP were hydroloyzed faster in non-sterile sediment than in sediment which had been sterilized. The half life for TPP hydrolysis was 1.76 days at pH 5, 1.61 days at pH 7, and 2.16 days at pH 9. PP hydrolysis was increased as pH was increased from 5 to 7 to 9 as indicated by half lives of 13.7, 10.0 and 7.3 days, respectively. When TPP was added to the sediment as a Ca5 (P3010)2 precipitate the rate of hydrolysis was slower (1/2life = 2.79 days) than when TPP was added as a solution (1/2life = 1.68 days).
W74-05542

EVOLUTION OF THE ISOTOPIC COMPOSITION OF LEAD IN ANCIENT MARINE BASINS (K VOPROSU OB EVOLYUTSII IZOTOPNOGO SOSTAVA SVINTSA V DREVNIKH MORSKIKH BASSEYNAKH),
Akademiya Nauk SSSR, Leningrad. Institut Geologii i Geokhronologii Dokembriya.
For primary bibliographic entry see Field 2F.
W74-05559

RESULTS OF MONITORING FOR TRITIUM INCORPORATION AT THE KARLSRUHE NUCLEAR RESEARCH CENTER IN 1971 AND 1972, (ERGEBNISSE DER TRITIUM-INKORPORATIONSUBERWACHUNG IM KERNFORSCHUNGSZENTRUM KARLSRUHE IN DEN JAHREN, 1971-1972),
Kernforschungszentrum, Karlsruhe (West Germany).
H. Schieferdecker.
Available from NTIS, Springfield, Va., as Rept. No. KFK-EXT-23/73-1; $3.00 per copy, $1.45 microfiche. Externer Bericht 23/73-1, April 1973. 12 p, 5 tab. English summary.

Descriptors: *Monitoring, *Tritium, *Assay, *Measurement, Safety, Regulation, Standards, Control, Public health, Nuclear powerplants, Effluent, Fuels.
Identifiers: *Germany(Karlsruhe), Fuel reprocessing.

The results of the monitoring activities for tritium incorporation at the Karlsruhe Nuclear Research Center in 1971 and 1972 show that there have been no increases in incorporations relative to previous years, despite the increasing work load. In no case was the maximum permissible dose exceeded. The maximum dose due to H-3 incorporation was between 50 and 500 mrem/a. (Houser-ORNL)
W74-05613

DETERMINATION OF SULFATE USING FERRIC ION-SELECTIVE ELECTRODE,
R. J. Jasinski, and I. Trachtenberg.
Available from NTIS as PB-220 443, $3.00 paper copy; $1.45 microfiche. Department of the Interior, Office of the Solicitor, Patent Application Serial Number 350,444, April 1973. 9 p, 2 fig.

Descriptors: *Patents, Chemical reactions, Sea water, Industrial wastes, Brackish water, Pollution abatement, Water quality control, *Electrodes, Sulfates, Analytical techniques, *Pollutant identification, Measurement, Aqueous solutions.
Identifiers: *Sulfate ions, Ferric ions, *Sensors, *Ion selective electrodes.

Detection and measurement of the concentration of various ions in aqueous solution by means of ion selective electrodes finds utility in a variety of environmental and industrial applications. Analytical potentiometry, and ion selective electrodes or sensors therefore, can be employed for control of water quality, to obtain optimum yields in chemical processes, etc. Sulfate ion concentration in aqueous solution is determined by initially adding a known concentration of ferric ion to the solution, and adjusting the pH of the solution to a suitable value, whereby ferric ion is complexed by the sulfate ion. The activity of the remaining, uncomplexed ferric ion is then measured by means of a ferric ion-selective electrode. (Sinha - OEIS)
W74-05693

CHARACTERISTICS OF CONDENSER WATER DISCHARGE ON THE SEA SURFACE (CORRELATION OF FIELD OBSERVATIONS WITH THEORY),
Massachusetts Inst. of Tech., Cambridge.
S. C. Doret, D. R. F. Harleman, A. T. Ippen, and B. R. Pearce.
Available from NTIS as COM 73-11294, $4.50 in paper copy, $1.45 microfiche. Sea Grant Publication Report No. MITSG 73-12, Index No. 73-312-Ccs, June 1973. 124 p, 35 fig, 3 tab, 9 ref, 22 plates. NOAA NG-43-72.

Descriptors: Massachusetts, *Electric powerplants, *Heated water, *Nuclear powerplants, Measurement, *Thermal pollution.
Identifiers: Coastal waters, Pilgrim Nuclear Power Station(Mass), Condenser water, Sea surface, Temperature distributions, Waste heat, Plumes.

Field measurements of the condenser water discharge plume at the Pilgrim Nuclear Power Station were conducted during three survey periods between January and April 1973. Horizontal temperature profiles of the plume were obtained for two water depths. Vertical temperature profiles were obtained in the far field to establish the ambient water conditions for the various survey periods. Plume centerline temperature reduction versus distance and surface isotherm areas were determined from the field data. Analytical predictions for field results of both centerline temperature reduction versus distance and surface isotherm areas show good agreement when discharge conditions are relatively constant for a period of an hour or more. Theoretical predictions of center-line temperature reduction versus distance and surface isotherm areas for the mid tide phase when the jet characteristics are changing most rapidly do not agree with the field results. An attempt to reduce the unsteadiness of the field conditions by time weighted average (1/2 tidal cycle) and comparison to the time weighted average of the theory was made for the centerline temperature reduction versus distance field results. The results were reasonably successful but the unsteady influence of the mid tide phase could not be completely eliminated by this method. Sensitivity of the analytical model to cross currents and heat loss coefficient were determined to be minimal. Changes in channel geometry at the mouth of the discharge channel occurred due to winter storms. Since the discharge channel geometry is not known exactly, a precise comparison with the analytical model is difficult particularly at low tide when the effects of changes in the exit section are most important. Winter weather conditions at the site prohibited continuous ambient current measurement by the power company. (Sinha - OEIS)
W74-05700

HANDBOOK FOR MONITORING INDUSTRIAL WASTEWATER.
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
Environmental Protection Agency Office of Technology Transfer Handbook, August 1973. 175 p, 59 fig, 24 tab.

Descriptors: *Monitoring, *Industrial wastes, *Water pollution control, Instrumentation, Water analysis, Sampling, Data collections, Automation, Municipal wastes.
Identifiers: *Combined treatment.

Information is presented for use and reference in planning, executing and continuing a program of industrial waste monitoring. Philosophy of monitoring needs, planning, sampling, measuring, and analysis are presented for familiarization by industrial plant managers. Sufficient detail is given for those who wish to explore more deeply some of the practical and theoretical aspects of monitoring programs. A logical procedure is suggested and direction given for industrial plant waste control programs. Automated sampling, measuring, and analytical devices are described and methods of use outlined. Manual procedures and non-automated methods are also presented. Use of the collected data is discussed. Special considerations for industrial-municipal joint treatment are described. Numerous references are included for the reader who needs more detailed information on special tests, equipment or procedures necessary for the successful conduct of a monitoring program. (Knapp-USGS)
W74-05862

OXYGEN ANALYZER,
Lowrance Electronics, Inc., Tulsa, Okla. (Assignee).
H. A. Cramer.
U.S. Patent No. 3,782,170, 3p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 918, No 1, p 179, January 1, 1974.

Descriptors: *Patents, *Dissolved oxygen, *Instrumentation, Measurement, Water pollution, *Oxygen, Electrodes, Monitoring, Pollutant identification.

A small instrument can be inserted into a body of water or other liquid to make a determination of the concentration of free dissolved oxygen in the water. It comprises a cylindrical tube with an end plate and a permanent magnet placed coaxial with the tube with its south pole in contact with the end plate. The length of the magnet is approximately one half or less the length of the cylindrical tube. A pair of electrodes are positioned in the wall of the

ube, approximately at the middle of the length of he tube. A disc having a number of holes to permit assage of water axially along the inside of the ube, is mounted across the cross section of the ube, closely spaced from the electrodes. When a attery is connected to the electrodes a current vill flow. Negative ions will be deflected by the nagnetic field toward the magnet and so will be in-ercepted by the grid. The magnitude of this cur-ent can be determined by a meter which is con-ected in the lead from the grid to the positive pole f the battery. (Sinha-OEIS)
V74-05909

ATP POOLS IN ACTIVATED SLUDGE,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W74-05914

MAJOR ELEMENT GEOCHEMISTRY OF LAKE POWELL,
Dartmouth Coll., Hanover, N.H. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2H.
W74-05923

WATER RESOURCES DATA FOR NEW YORK, 1972: PART 2. WATER QUALITY RECORDS.
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 2E.
W74-05931

5B. Sources Of Pollution

NITROGEN UPTAKE EFFICIENCY BY FOUR PLANT SPECIES IN THE FIELD AND GROWTH CHAMBER,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
L. H. Edwards, D. D. Warncke, S. A. Barber, and D. W. Nelson.
Available from the National Technical Information Service as PB-229 638, $6.00 in paper copy, $1.45 in microfiche. Technical Report No. 40, 1973. 48 p, 2 fig, 25 tab, 7 ref. OWRR B-026-IND(3).

Descriptors: *Groundwater, *Nitrates, *Farm management, *Root development, *Deep percolation, Crop production, Planting management, Soil management, Underground field crops, Nitrogen compounds, Ammonium salts, Root systems, Absorption, Soil-water-plant relationships, *Path of pollutants, Water pollution control.
Identifiers: Ammonium-nitrate ratios, Shoot-root ratio, Uptake coefficient.

Cropping patterns were studied to ascertain how most effectively to reduce the level of nitrate in the soil to lessen the amount subject to leaching and moving into drainage water. Sorghum and sudax grown in the field removed greater amounts of nitrogen than corn or wheat. In corn, the nitrogen flux into a root reached a maximum by 18 to 24 days and decreased rapidly to tasselling. The amount of nitrogen leaching from the soil can be reduced if added only in the ammonium form and maintained as ammonium by imbibition. Comparisons made between ammonium and nitrate in nutrient cultures for corn showed that the two sources of N were absorbed at equal rates at all stages of plant growth. The research showed that the plant roots of a number of common crop species had the ability to reduce the nitrate in solution to very low levels. The level found in the soil after cropping was one to two orders of magnitude larger than this apparently because the nitrate must move to the root before it is positionally available for absorption. Cultural practices that increase root density, particularly in the subsoil should cause more efficient nitrogen use.
W74-05404

THE MICROBIOLOGY OF ACID MINE WATER TREATMENT IN PACKED BED COLUMNS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-05409

MASS TRANSFER IN HETEROGENEOUS SYSTEMS AND VELOCITY AND GAS ABSORPTION STUDIES FOR SINGLE BUBBLES,
Iowa State Univ., Ames. Dept. of Chemical Engineering.
A. Mukerjee.
Available from the National Technical Information Service as PB-229 560, $17.50 in paper copy, $1.45 in microfiche. Ph D Thesis, 1973. 263 p, 57 fig, 12 tab, 77 ref. OWRR B-030-IA(1).

Descriptors: *Mass transfer, *Surfactants, *Bacteria, *Bubbles, Aeration, Dissolved oxygen, Reaeration, Oxidation, Fermentation, Water pollution effects, Water pollution treatment.

The effects of surface active materials on gas absorption were studied in reactive and nonreactive systems. Bacterial cell particles including Acetobacter rancens, Acetobacter suboxydans, and Acetobacter xylinum, increase the mass transfer rate of oxygen in the oxidation of glucose to gluconic acid at pH 6.12. Direct uptake of oxygen by the cells, decrease in the film thickness, and local surface turbulence were demonstrated. The presence of surfactants (1 ppm to 500 ppm) retards the rise velocity 40% for bubbles 0.31 cm diameter and 24% for bubbles 0.49 cm to 0.58 cm diameter. The concentrated interfacial layer of surfactant molecules shifts the point of separation, increases the drag force and imparts a rigid sphere behavior. Rise velocity of soluble bubbles in general is retarded by the simultaneous mass transfer process. For the range of bubble sizes examined, the rate of mass transfer from smaller bubbles is higher. A differential equation was derived to describe the phenomenon of a dissolving oxygen bubble rising in a frozen lake. Parameters such as lake depth, temperature profile, BOD, and pollutant concentration are considered in dimensionless form. Numerical solutions indicate a striking difference in gas absorption due to the effect of surface active pollutants and suggests the feasibility of artificially oxygenating frozen lakes and streams to raise the DO concentration in the winter months. (Knapp-USGS)
W74-05413

SOURCES AND MOVEMENTS OF WATER--AN INTERIM REPORT.
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 2L.
W74-05415

STAFF REPORT ON COAL GASIFICATION: PROCESSES AND EFFECTS,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
J. P. Chasse.
Manuscript, October 1973. 28 p, 5 fig, 1 tab, 12 ref.

Descriptors: *Hydrate processes, *Thermal pollution, Chemical reactions, Coals, Carbon, Gases, Industrial production, *Fossil fuels, Nuclear powerplants, Thermal powerplants, Steam turbines, Electric power production, Environmental effects.
Identifiers: *Coal gasification.

Coal gasification offers enormous potential both for alleviating projected shortages of natural gas for consumer use and for fueling advanced-cycle electric generating units. The first circumstance has already achieved limited commercial application and is receiving significant research effort to develop new processes. The latter situation, while requiring a less sophisticated gasification process, is at a lesser stage of development. This is primarily due to a lack of technology relative to the integrated gasification/power generation system. The projected commercial size installations are 250 x 1,000,000 scf/day for high-Btu pipeline gas (950 Btu/scf) and 700 x 1,000,000 scf/day for low-Btu fuel gas (175 Btu/scf). On that scale, pipeline gas production is a more potential threat to the environment, primarily due to its lower anticipated efficiency: 65 percent versus 82 percent for the fuel gas plant. The substitute natural gas plant will consume up to 25,000 tons of coal and 9 million gallons of water per day. In doing so it will generate up to 250 tons of sulfur and 5,000 tons of ash per day. The fuel gasification/power generation system, however, promises to be less polluting than the alternative fossil-fuel steam plant. Comparison of the two coal gasification processes is, of course, artificial being dependent on the actual scale of the operations. Nevertheless, when compared with the alternative fuel sources, high-Btu gas will present more difficult problems. A major advantage of the gasification/generation system will be the potential for reduced thermal pollution. If thermal efficiencies of 82, 85, and 88 percent are achieved for the first, second, and third-generation gasification processes, the thermal heat rejection for the COGAS system can be estimated. The overall efficiencies include a 2 percent loss in the generator and a 2 percent pumping load. Liquid thermal pollution for a combined-cycle operation would be considerably less than for a conventional electric generating plant. Problems of make-up water supply would be correspondingly diminished.
W74-05416

ASSESSMENT OF THE LOSS OF RADIOACTIVE ISOTOPES FROM WASTE SOLIDS TO THE ENVIRONMENT. PART 1: BACKGROUND AND THEORY,
Oak Ridge National Lab.
H. W. Godbee, and D. S. Joy.
Available from NTIS, Springfield, Va., as ORNL-TM-4333, $5.45 per copy, $1.45 microfiche. Report No. ORNL-TM-4333, February 1974. 65 p, 5 fig, 7 tab, 34 ref.

Descriptors: *Nuclear wastes, *Waste treatment, *Waste disposal, Environment, Radioisotopes, *Solid wastes, Leaching, Path of pollutants, Water pollution, Soil contamination, Degradation(Decomposition), Assay, Safety, Public health.

Assessments of the amounts of radioactivity from waste solids that enter the environment are needed for engineering, economic, and safety evaluations of proposed waste treatment, storage, transport, and disposal systems. This report presents several theoretical expressions based on mass transport phenomena that relate the radioactivity escaping from such solids to diffusion, dissolution processes, surface conditions, and radioactive decay. Representative available data for radioactive waste solids incorporated in cement, asphalt, ceramic and glass media are analyzed using the theoretical expressions presented. These analyses show that an expression taking into account diffusion and concentration-dependent dissolution gives good agreement with the data for most of the products considered. Once determined, parameters can be used to compare various waste products and to estimate releases from these products, in particular, long-term releases. (Houser-ORNL)
W74-05419

ASSESSMENT OF POTENTIAL RADIOOLOGICAL HEALTH EFFECTS FROM RANDON IN NATURAL GAS,
Office of Radiation Programs, Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-05420

DOSE AND RISK CONSIDERATIONS FOR THE RELEASE OF I-131 AT SPECIAL SITES,
Kernforschungszentrum, Karlsruhe (West Germany). Institut fuer Neutronenphysik und Reaktortechnik.
For primary bibliographic entry see Field 5C.
W74-05421

A STOCHASTIC STUDY ON THE CONCENTRATION PROCESS OF RADIOACTIVE SUBSTANCES TO AQUATIC ORGANISMS,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
I. Aoyama, and Y. Inoue.
Health Physics, Vol 26, No 2, p 191-198, Feb 1974. 9 fig, 7 tab, 9 ref.

Descriptors: *Water pollution sources, *Radioisotopes, *Radiation effects, *Aquatic microorganisms, Aquatic environment, Equation, Mathematics, *Stochastic processes, Markov processes, Time series analysis, Operations research, Mathematical studies, Model studies, Water pollution effects.

In a previous paper, the authors attempted to explain the dynamic concentration process of radioactive substances in organisms using a Markov process. The phenomenon was well depicted when the concentration of the radioactivity in the environmental water was kept constant. In this paper, an attempt is made to explain the radioactive contamination of organisms as a time series using a birth-death process, which is one of the stochastic processes. The existing probability Pi(t) that the concentration step of organisms is in the concentration step 'i' at an arbitrary time t is given as follows: P sub i (t) equals (m(t) exp i/i factorial)-all raised to the minus m(t) power, where m(t) is a mean concentration step obtained from an exponential model. Using this analytical method, it is found that the theory can be applied generally to cases in which the concentration in the environmental water varies with time t and that the concentration distribution follows the Poisson distribution whose parameter m(t) is equal to the mean value of the concentration steps. (Houser-ORNL)
W74-05429

ENVIRONMENTAL RADIATION SURVEILLANCE OF THE OYSTER CREEK NUCLEAR GENERATING STATION.
New Jersey Dept. of Environmental Protection, Trenton. Div. of Environmental Quality.
For primary bibliographic entry see Field 5A.
W74-05430

RESPONSE OF RIVER WATER TO BIOCHEMICALLY DEGRADABLE SUBSTANCES IN PULP MILL WASTE WATER (ODEZVA REKY NA BIOCHEMICKY ODBOURATELNE LATKY V ODPADNICH VODACH Z CELULOZEK),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
J. Schmied.
Papir a Celuloza, Vol 28, No 6, p 117-119, 1973. 1 tab, 4 fig, 6 ref.

Descriptors: *Pulp wastes, *Dissolved oxygen, Water pollution sources, *Oxygen sag, *Mathematical models, *Simulation analysis, Organic loading, Equations, Aeration, Industrial wastes, Pulp and paper industry, Kinetics, *Path of pollutants.
Identifiers: Site selection, Streeter-Phelps equation.

Biodegradable matter introduced into a stream causes depletion of dissolved oxygen. The depletion rate and the re-aeration rate can be determined, and the reaction rate constants can be used to assess the effect of organic pollutants on river water quality. A methematical model based on the Streeter-Phelps equation was developed, which permits the dissolved oxygen level to be determined as function of pollution load and time. Illustrative examples of calculations are given. Such calculations should always be included in pulp mill site selection procedures, so as to minimize effluent damage to streams. (Trubacek-IPC)
W74-05431

REDUCTION OF POLLUTANTS IN EFFLUENTS (UMEN'SHENIE POSTUPAYUSHCHIKH V STOK ZAGRYAZNENII),
G. E. Gal'per, M. V. Nikolaeva, R. E. Smirnov, and Ya. V. Nikitin.
Bumazhnaya Promyshlennost', No 6, p 8, June 1973. 2 tab, 1 fig.

Descriptors: *Pulp wastes, *Sulfite liquors, *Effluents, *Organic loading, *Suspended solids, Dissolved solids, Chemical oxygen demand, Effluents, Foreign research, Water pollution sources, Pulp and paper industry.
Identifiers: Sulfite pulping, Multistage pulping, Pulp yield, Spent sulfite liquor, Spent pulping liquors, Soviet Union.

Laboratory comparisons of spent sulfite pulping liquors (SSL) from a two-stage bisulfite-sulfite process vs. a conventional single-stage cook indicated that the two-stage SSL contained much lower concentrations of solids, organic loading, COD, and reducing compounds than the single-stage SSL. In addition, the two-stage pulp was brighter, stronger, and obtained in higher yields (55% compared to 50% for conventional sulfite pulp). (Stapinski-IPC)
W74-05432

CONVERSION OF SOME ORGANOPHOSPHORUS INSECTICIDES ON ADSORBING SURFACES AS AFFECTED BY FORMULATION,
Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soils and Water.
U. Mingelgrin, and B. Yaron.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 5, p 285-290, November 1973. 1 fig, 3 tab, 4 ref.

Descriptors: *Organophosphorus pesticides, *Adsorption, Formulation, *Pesticide kinetics, *Triazine pesticides, Aqueous solutions, Degradation(Decomposition), Calcium, Bentonite, Kaolinite, Peat, Ultraviolet radiation, *Gas chromatography, Centrifugation, Acaricides, Insecticides, Phosphothioate pesticides, Persistence.
Identifiers: Flame ionization gas chromatography, *Adsorbents, Pirimiphos-ethyl, Pirimiphos-methyl, Menazon, Saphizon D.P., Gas liquid chromatography, Metabolites.

This work was designed to investigate the effect of the manufacturers' formulations upon the behavior of Pirimiphos-ethyl and methyl and Menazon in the presence of natural adsorbents. Sixteen ppm active ingredient solutions of Pirimiphos-ethyl; Pirimiphos-methyl; JF2765 (Pirimiphos-ethyl emulsifiable concentrate); JF2764 (Pirimiphos-methyl emulsifiable concentrate); Menazon; and Saphizon D.P. (formulated Menazon) in 0.4 percent W.W. acetone in water were prepared. The above solutions were shaken with Ca-bentonite, Ca-kaolinite and Ca-peat (pH 5.5) with the ratio of 100:1 solution:solid, for 72 hours. Samples of the suspensions thus formed were taken at 0.5, 2, 5, 24 and 72 hours. The suspensions were centrifuged at 5000 rpm for 20 min and the supernatant was separated from the precipitate. After 5 hours and 72 hours, in the case of Pirimiphos-ethyl, Pirimiphos-methyl and their formulations, the precipitate was dried at room temperature overnight, and then extracted with hexane. UV spectra and GLC were taken from both the supernatant and the hexane extracts. Two interesting facts stand out from the results. Firstly, the unusual relatively high adsorption of Pirimiphos-ethyl upon Ca-kaolinite. Secondly, it seems that the adsorption of all pesticides is on slightly influenced the presence of the formulan Even this preliminary data using arbitrary form lations, indicate the potential stored in the use formulants for the purpose of affecting the chen cal and biological behavior of pesticides after a plication. (Mortland-Battelle)
W74-05435

FLOCCULATION OF SUSPENDED SEDIMEN IN THE SEA,
Bedford Inst., Dartmouth (Nova Scotia). Atlant Oceanographic Lab.
K. Kranck.
Nature, Vol 246, No 5432, p 348-350, December 1973. 3 fig, 17 ref.

Descriptors: *Sediments, *Sea wate *Flocculation, Inorganic compounds, Suspende solids, Particle size, Salinity, Water temperatur Mineralogy, Current, Turbidity, Analytic techniques, Straits, Inlets(Waterways), Bay *Canada.
Identifiers: Particle concentration, Sample prese vation, *Flocs(Inorganic), Fate of pollutant Coulter Counter.

To determine the nature and mode of formation inorganic flocs, the concentration, grain size a general nature of the suspended particulate matt in over 500 samples from a variety of coastal e vironments have been studied. The samples we stored cold and dark and analyzed as soon possible but always within a few days of colle tion. An inverted phase contrast microscope w used for qualitative identification of the partic late matter. The size and concentration of particl between about 1 and 100 microns were measure with a model T Coulter Counter and the resul plotted as particle spectra showing the equivale spherical diameter of the particle volume relati to concentration in parts per million. Flocs we observed in all samples and formed the majority particles in samples from highly turbulent area and from near the bottom in regions of mud sediment. The samples from these waters, high inorganic sediment when analyzed by Coult Counter, were characterized by regular, almo symmetrical, broad distribution with we developed modes. Total particle concentrations the flocculated samples varied from 0.5 to 20 p.p and modes usually ranged between 6 and microns. There was no relationship between th mode size and the concentration of particulat matter, nor did any difference in concentration particulate matter, nor did any difference mineralogical composition between the samples in the salinity and temperature of the seawate seem to have affected the flocculation process. distinct relationship was noted between mode siz and current speed of the water at the place of co lection. (Mortland-Battelle)
W74-05441

THE PRODUCTION OF PARTICLES IN TH SURFACE WATERS OF THE OCEAN WIT PARTICULAR REFERENCE TO THE SARGAS SO SEA,
Bedford Inst., Dartmouth (Nova Scotia).
R. W. Sheldon, W. H. Sutcliffe, Jr., and A. Prakash.
Limnology and Oceanography, Vol 18, No 5, 719-733, September 1973. 9 fig, 1 tab, 38 ref.

Descriptors: *Sea water, Surface waters, *Foo chains, *Primary productivity, Ecosystems Radioactivity techniques, *Particle size, Growt rates, Water sampling, Diurnal, Water tempera ture, Oceans, Incubation, Diatoms, Protozoa Zooplankton, Copepods, Marine fish, Marin animals, Marine bacteria.
Identifiers: *Sargasso Sea, ATP, Particle concen tration, Coulter Counter, Flagellates.

A series of observations and experiments hav shown that it is possible to increase our un

:rstanding of marine production simply by look-g at particle formation. Particle size and concen-ation were measured with a model T Coulter ounter. Many of the observations standardized n a particle size range from 1 micron to 100 icrons. This includes most of the particles likely be involved in primary production. The amount f living material was estimated from measure-ents of the adenosine triphosphate (ATP) con-ntration of the particulate material. Particle owth was measured by incubating sea water mples in bottles, the particle concentration olume and ATP) being measured before and ter incubation. The samples were collected at a pth of 1 m with a simple float and bottle sam-er. In the surface waters of the ocean particle oduction and consumption are in balance. The ructure of the pelagic food chain and the orphological limitations dictated by the environ-ent are such that, in general, large particles have consume smaller ones. If the large particles are moved the small particles cannot be consumed id their production rate can be measured. A state f exponential growth seems to be normal. The te of production, as revealed by small particle owth following predation release, is much eater than the apparent rate of primary produc-on indicated by radiocarbon uptake. (Mortland-attelle)
774-05453

EMPORAL AND DEPTH STUDY OF AL-ALINE EARTH CHLORINITY RATIOS IN EAWATER AT A SINGLE STATION SOUTH F PUERTO RICO,
uerto Rico Univ., Mayaguez. Dept. of Marine ciences.
. K. Atwood, P. N. Froelich, and W. F. Kinard.
imnology and Oceanography, Vol 18, No 5, p 71-783, September 1973. 1 fig, 7 tab, 29 ref.

Descriptors: *Salinity, Calcium, Magnesium, trontium, *Temporal distribution, Depth, *Sea ater, Distribution patterns, Surface waters, olumetric analysis, *Puerto Rico, *Alkaline arth metals.
dentifiers: *Chlorinity ratios, Atomic absorption pectrophotometry, EDTA.

esults of an 11-month study of calcium, magnesi-m, and strontium chlorinity ratios at a single sta-on south of Puerto Rico are reported for depths own to 2,500 m. Samples were filtered through .45-micron Millipore filters and stored in high ensity polyethylene bottles at 2 C until analysis. alinities were determined to plus or minus 0.01 er thousand with an induction salinometer. Stron-um was determined by atomic absorption spec-oscopy with a spectrophotometer. Each sample as analyzed twice; once directly and once with a 0 ppm Sr spike added as an internal standard. Cal-ium was determined by first precipitating mag-esium as Mg(OH)2 by adjusting the pH to 12 with aOH solution, then determining the combined alcium and strontium by titration with ethylene iamine tetracetic acid (EDTA), and subtracting ie concentration of strontium. Magnesium was etermined by first determining the total concen-ation of calcium, strontium, and magnesium and ubtracting the concentration of calcium and trontium. This was done by titrating with di-Na-DTA at pH 10 using Eriochrome Black T as an dicator. No temporal variations for any of these tios were apparent within the precision of the nalytical techniques used; however, careful valuation of the variation in Sr:Cl per thousand ust await more precise analysis. There was some dication that Ca:Cl per thousand was lower in urface and near surface waters than below 500 m. onversely, there was evidence that the Mg:Cl per ousand was higher in upper waters than below 00 m. (Mortland-Battelle)
W74-05457

THE PERSISTENCE AND MOVEMENT OF PICLORAM AND 2,4,5-T IN SOILS,
North Carolina State Univ., Raleigh. Pesticide Residue Research Lab.
J. F. Lutz, G. E. Byers, and T. J. Sheets.
Journal of Environmental Quality, Vol 2, No 4, p 485-488, October-December 1973. 1 fig, 5 tab, 24 ref.

Descriptors: Persistence, Movement, *Path of pollutants, *Pesticide kinetics, *Watersheds(Basins), *2 4 5-T, Leaching, Chlorinated hydrocarbon pesticides, Soil physical properties, Chemical analysis, Sampling, Soil chemical properties, *North Carolina, Methodology, Herbicides, Soils, Environmental effects, Soil analysis, Solvent extractions, Cores, Soil temperature, Climatic data, Bulk density, Depth, Organic matter, Hydrogen ion concentration, Air temperature, Hydraulic conductivity, Porosity, Clay loam, Pesticide residues.
Identifiers: *Picloram, Electron capture gas chromatography, Sample preparation, Chemical recovery, Sandy loam.

The movement and persistence of picloram (4-amino-3,5,6-trichloropicolinic acid) and 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) were studied on a western North Carolina watershed on which extensive agronomic, hydrologic, and climatic data had been accumulated over a period of 18 years. Immediately after spraying, 20 core samples were taken to a depth of 5 cm and composited for determination of the amount of herbicide reaching the soil. The samples were placed in polyethylene bags and frozen. Additional samples (10 cores each) were taken 15, 50, and 100 days after spraying. Prior to analysis, the samples were thawed, air-dried, and sieved through a 2-mm sieve. A 50-g sample was acidified with 0.25 N HCl, mixed with ethyl acetate, shaken for 30 min, and filtered. After a second extraction, the solvent was combined with the first extract which was then made basic with NH4OH. The herbicides were partitioned into water, the aqueous solution acidified, and the herbicides partitioned back into ethyl acetate. Base was added, the solvent evaporated and the herbicides dissolved in methanol, methylated with diazomethane, and determined by electron capture gas chromatography. Picloram was more persistent than 2,4,5-T; approximately 60 percent of the picloram and 90 percent of the 2,4,5-T disappeared in 15 days. There was some penetration into the soil, but a very high percentage of the total amount present at the different sampling periods was in the 0- to 7.5-cm layer. Doubling the application rate (4.48 vs 2.24 kg/ha) resulted in a two-fold increase in the amount of herbicide recovered at each sampling period. Very little downslope movement of either herbicide occurred even though the average slope on the plots was approximately 27 percent. Practically no herbicide was found more than 0.3 m, and none beyond 1.2 m, downslope. More picloram than 2,4,5-T moved. (Holoman-Battelle)
W74-05459

INOSITOL POLYPHOSPHATES IN ACTIVATED SLUDGE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).
D. J. Cosgrove.
Journal of Environmental Quality, Vol 2, No 4, p 483-485, October-December 1973. 1 fig, 2 tab, 12 ref.

Descriptors: *Activated sludge, Chemical analysis, *Pollutant identification, Methodology, Organophosphorus compounds, Phosphorus, Separation techniques, Hydrolysis, Solvent extractions, *Phosphorus compounds, *Phosphates, *Chromatography.
Identifiers: Sample preparation, Inositol polyphosphates, *Ion exchange chromatography, Paper chromatography, Organophosphates, Myo-inositol hexaphosphate, Scyllo-inositol hexaphosphate, Chiro-inositol hexaphosphate, Neo-inositol hexaphosphate, Myo-inositol pentaphosphate, Chiro-inositol pentaphosphate, Scyllo-inositol pentaphosphate, Neo-inositol pentaphosphate.

Although it is known that some of the soluble inorganic phosphate present in waste water can be fixed as organic forms in the activated sludge process, there is little knowledge of the chemical nature of these products. Recently, the extraction of 'inositol phosphate' from activated sludge was described, but whether the product consisted only of myo-inositol phosphates or was a mixture was not determined. In the present investigation, inositol polyphosphates were extracted from activated sludge using methods previously developed in investigations of soil organic phosphates. Ion exchange chromatography of the purified extract showed it to be a mixture of penta- and neo-inositol and thus to resemble the inositol polyphosphate component of soil organic matter. As the same polyphosphate mixture does not apparently occur in raw sewage (hydrolysates of dried raw sewage were found to contain no other inositol but the myo-isomer), it would appear that it is formed as a result of biological action during the aeration process. (Holoman-Battelle)
W74-05467

ANIONIC ELECTROPHORETIC PATTERN OF FIVE RUTHENIUM SALTS IN FRESH AND SEA WATER: EFFECTS OF AGING AND DILUTION,
Centre d'Etude de l'Energie Nucleaire, Mol (Belgium). Laboratoires.
For primary bibliographic entry see Field 5A.
W74-05479

ALGAE IN THE SPOON RIVER, ILLINOIS 1971-1972,
Illinois State Water Survey, Peoria. Water Quality Section.
S. Lin, R. L. Evans, and D. B. Beuscher.
Water Resources Bulletin, Vol 9, No 6, p 1112-1124, December 1973. 9 fig, 5 tab, 15 ref.

Descriptors: *Chrysophyta, *Chlorophyta, *Euglenophyta, *Aquatic algae, *Cyanophyta, Temporal distribution, Ecological distribution, Dominant organisms, Water quality, Diatoms, Dissolved oxygen, River flow, Coliforms, Water sampling, Streamflow, Water temperature, Microscopy, Spatial distribution, Probability, Nutrients, Speciation, Anabaena, Chlorella, Scenedesmus, Chlamydomonas, Euglena, *Illinois.
Identifiers: Species density, *Species diversity index, *Spoon River(Ill.), Flagellates, Species diversity, Desmids, Sample preservation, Enumeration, Fecal coliforms, Aphanizomenon, Oscillatoria, Actinastrum, Ankistrodesmus, Coelastrum, Crucigenia, Oocystis, Pediastrum, Ulothrix, Asterionella, Caloneis, Cyclotella, Diatoma, Fragilaria, Gomphonema, Gyrosigma, Melosira, Navicula, Nitzschia, Pleurosigma, Rhoicosphenia, Stephanodiscus, Surirella, Synedra, Tabellaria, Dinobryon, Phascus.

As a part of a water quality survey of the Spoon River, Illinois, algal genera were identified and their densities were enumerated. Weekly samples were collected at five stations starting on June 1, 1971. This report presents the first year's results. Algal densities for each station were found to be distributed geometrically normal. Total algal densities increased as water progressed downstream. Although water temperature has been observed to be an important factor affecnd the composition of algae in streams, attempts to correlate algal densities with temperatures for the Spoon River were not fruitful. Correlations of algal densities with dissolved oxygen, flow, and coliform densities also could not be made. The dominant genera observed were Cyclotella, Navicula, Scenedesmus, and Euglena. On the average diatoms accounted for 87 percent of all algae counts. The average

diversity indices varied about 1.0 to 1.5 for five stations. There did not appear to be any advantage in the use of diversity index over that of algal density and genera richness in characterizing algae in the Spoon River. (Holoman-Battelle)
W74-05483

NITROGEN TRANSFORMATIONS IN SEDIMENTS AS AFFECTED BY CHEMICAL AMENDMENTS,
Wisconsin Univ., Madison. Dept. of Soil Science.
R. L. Chen, and D. R. Keeney.
Water Resources Bulletin, Vol 9, No 6, p 1136-1144, December 1973. 8 tab, 27 ref.

Descriptors: *Nitrogen, Sediments, Lakes, *Lake sediments, Hydrogen ion concentration, Water quality, Nitrification, Denitrification, Nitrogen fixation, *Calcium carbonate, Ammonification, Acids, Methane, *Wisconsin, Ammonia, Phosphorus, Iron, Oxygen, Calcium, Nitrates, Nitrites, Calcium chloride, Magnesium compounds.
Identifiers: Aluminum sulfate, Mineralization, Immobilization, Calcareous sediments, Sample preservation, Sodium carbonate, Acetylene reduction, Biotransformation, *Lake Mendota(Wis.), *Lake Tomahawak(Wis.).

A study was conducted to elucidate some of the chemical factors affecting the rate and pathways of N transformations in lake sediments. The main emphasis was placed on modifying a noncalcareous sediment with CaCO3 to approximate the composition of a sediment. Additionally, the effects of Ca (2 plus), CO3 (2 minus), Mg (2 plus) and OH (minus) were evaluated by using appropriate chemicals. Further, the effect of aluminum sulfate was evaluated with both sediment types. Sediment pH at 7 days was not affected by CaCO3, but was decreased by aluminum sulfate. The CaCO3 treatment increased the rate of ammonification, nitrification, reduction of acetylene to ethylene and methane formation, while with few execptions the other treatments decreased the rate of the transformations studied. Aluminum sulfate, which has been proposed as a lake restoration treatment, increased ammonification but decreased most of the other transformations. (Mortland-Battelle)
W74-05485

METHANE FORMATION BY LAKE SEDIMENTS DURING IN VITRO INCUBATION,
Wisconsin Univ., Madison. Dept. of Soil Science.
A. N. Macgregor, and D. R. Keeney.
Water Resources Bulletin, Vol 9, No 6, p 1153-1158, December 1973. 4 tab, 15 ref.

Descriptors: *Lake sediments, *Methane, *Synthesis, *Incubation, Nitrates, Sulfates, Water temperature, Sampling, Gas chromatography, Hardness(Water), *Wisconsin, Sediments, Lakes, Oxidation-reduction potential.
Identifiers: Acetylene, Carbon reduction, Helium atmosphere, Sample preservation, *Lake gases.

The ability of lake sediment samples to store and synthesize methane was tested using samples from Wisconsin lakes. Both hardwate and softwater lakes were investigated. The effects of nitrate, sulfate, and acetylene amendments, as well as temperature, were also investigated. Using a sediment-coated glass bead system as described, sediments showed linear increases in methane synthesis from the moment helium purging ceased for periods up to three weeks. The results indicate that the sediment samples examined have roughly the same capacity to store methane generated in vivo, but depending upon their origin (e.g. softwater or hardwater lakes) differ significantly in their capacity to synthesize methane from sediment precursors. Sediment samples from hardwater lakes produced 10 to 20 times as much methane as sediment from softwater lakes. This difference in methane generating capacity appears to be due to CaC03. It is apparent that measurement of standing crop of 'native methane' in sediments may not be a useful indication of the actual rate of methane synthesis. Both nitrate and sulphate were apparently able to inhibit methane synthesis by raising the Eh of the sediment to more positive values. Inhibition, at least by nitrate, may be temporary. (Mortland-Battelle)
W74-05487

TREND SULFACE ANALYSIS AND SEASONAL DISTRIBUTION PATTERNS OF PRIMARY NUTRIENTS AND CHLOROPHYLL IN UNSTRATIFIED GULF COAST ESTUARIES,
Texas Univ., Houston. School of Public Health.
I. Cechova, and E. M. Davis.
Water Resources Research, Vol 8, No 6, p 1543-1554, December 1973. 11 fig, 1 tab, 9 ref.

Descriptors: *Distribution patterns, *Nutrients, *Estuaries, Water pollution sources, *Seasonal, *Dispersion, *Chlorophyll, Mapping, *Texas, Mixing, Runoff, Phosphorus, Nitrogen, Carbon, Spatial districution, Data processing, Phosphates, Nitrates, Nitrites, Primary productivity, Movement, Temporal distribution.
Identifiers: Symap, Chlorophyll a, Data interpretation, Enrichment, Fate of pollutants.

The technique of data display, the synographic mapping system (Symap), was applied in ecological studies of unstratified Gulf Coast estuaries. Thirty-four computer maps of spatial distribution of primary nutrients and chlorophyll concentrations in San Antonio and Matagorda (Texas) estuaries were prepared from survey data covering the period 1970-1971. The maps provided a convenient means for detecting the sources of estuarine enrichment by primary nutrients and of seasonal changes in dispersion patterns. Weighted average concentrations of each compound in the entire estuarine water mass were determined from such displays and used in comparison of concentrations for different months of the survey period. The data presented on Symap displays were used in the determination of mixing and exchange efficiency in the estuaries. The results indicated that incoming nutrients often have very short residence times. The efficiency of exchange and residence time of each compound vary significantly within a year, conditioned by variable compound loading, quantity of tributary runoff, range of tidal activity, and variable biological food demand. An attempt was made to relate the chlorophyll a concentrations obtained as weighted averages from Symap displays to concentrations a phosphorus, nitrogen, and carbon, to the amount of tributary runoff, and to yearly seasons by means of coaxial graphical correlation. (Little-Battelle)
W74-05488

NITROGEN FIXATION IN A SUBARCTIC MIRE,
Kungliga Lantbrushogskolan, Uppsala (Sweden).
U. Granhall, and H. Selander.
Oikos, Vol 24, No 1, p 8-15, 1973. 2 fig, 6 tab, 26 ref.

Descriptors: *Nitrogen fixation, *Nitrogen fixing bacteria, *Cyanophyta, *Permafrost, *Marshes, Methane bacteria, Subarctic, Cold regions, Bogs, Mosses, Lichens.
Identifiers: *Acetylene reduction, *Sweden(Lappland).

An investigation of biological fixation of atmospheric nitrogen in situ, as part of the Swedish IBP Tundra Biome Project, was carried out during the summer of 1971. The main site was a subarctic - continental, ombrotrophic mire with permafrost, situated near Abisko in Lappland (northern Sweden). Nitrogen fixation was measured by the method of acetylene reduction. Samples of moss and algae were examined microscopically for N-fixing blue-green algae. Aerobic N-fixing bacteria were estimated on a modified Burk's Azotobacter medium. Methane-producing bacteria were cu tivated in Barker's selective medium. Lo nitrogen fixation, mainly by aerobic bacteria, o curred in elevated (ombrotrophic) areas of t mire. In large wet depressions and pools, on t other hand, fixation by blue-green algae was qui appreciable. The algae were found to be epiphy cally or intracellularly associated with Sphagnu and Drepanocladus mosses. Lichens with blu green algal phycobionts or cephalodia were rare the investigated site, and the few plants test showed comparatively small activity, probab due to poor nutritional status (ombrotrophic conc tions). In other parts of the Tornetrask area th were, however, considered to be of great i portance. (Little-Battelle)
W74-05489

METAL COORDINATION COMPOUNDS C THIABENDAZOLE,
Western Washington Research and Extensi Center, Puyallup.
For primary bibliographic entry see Field 5A.
W74-05490

THE KINETICS OF YEAST GROWTH C PURE HYDROCARBONS,
Eidgenoessische Technische Hochschule, Zuri (Switzerland). Microbiological Inst.
H. W. Blanch, and A. Einsele.
Biotechnology and Bioengineering, Vol 15, No p 861-877, September 1973. 12 fig, 36 ref.

Descriptors: *Yeasts, *Growth chambe *Organic compounds.
Identifiers: *Substrate utilization, *Hexadecan *Growth kinetics, Continuous cultures, Candi tropicalis, Aliphatic hydrocarbons, Deuter mycetes, Biological flocculation.

The kinetics of C. tropicalis growth were i vestigated with pure n-hexadecane as idspers phase substrate. Two distinct growth phases we found; in the first phase, exponential growth w independent of stirrer speed. The onset of second phase, one of linear growth, was det mined by stirrer speed. By the use of two differe fermenter types, it was shown that the drop size the dispersed phase was not primarily responsi for the observed kinetics. It was considered th the formation of biological flocesd the observ growth pattern. This was substantiated by t results of continuous cultures in the different fe menter types, with various substrate concentr tions. (Holoman-Battelle)
W74-05493

TRANSPORT, FATE AND GEOCHEMICAL I TERACTIONS OF MERCURY, CADMIUM AN OTHER INORGANIC POLLUTANTS IN TH COASTAL LITTORAL-SALT MARSH E VIRONMENT OF THE SOUTHEASTER UNITED STATES.
Skidaway Inst. of Oceanography, Savannah, Ga.
Available from the National Technical Inform tion Service as PB-230 037 $6.00 in paper cop $1.45 in microfiche. Annual Progress Repo January 1974. 242 p. EPA R-800372.

Descriptors: *Path of pollutants, *Heavy metal *Estuaries, *Water chemistry, *Atlantic Coast Plain, Mercury, Cadmium, Copper, Iron, Ma ganese, Salt marshes, Water chemistry, Organ matter, Sorption, Chemical precipitatio Suspended load, *Southeast U.S., South Carolin Georgia, Florida.

Study of the transport, fate, and geochemical i teraction of heavy metals (primarily mercury a cadmium) being transported into the littoral s marsh environment in the Southeastern Unit States Coast between Georgetown, S.C., a Jacksonville, Fla., involves both field and labor tory studies. The concentration of Hg, Cd, Cu, I and Mn in water and suspended sediments sampl

m the major rivers emptying along the utheastern Atlantic Coast was determined nonthly to establish seasonal and spatial varia-ns. The flux of heavy metals through salt marsh tuaries is controlled by processes which occur at ver-estuary and salt marsh-sediment boundaries. iese processes include adsorption-desorption actions, flocculation, precipitation and sedimen-ion. Along with estuarine circulation they effec-ely control the residence time of metals in tuaries. Some biological processes, such as up-ce by marsh vegetation, may serve as efficient echanisms to recycle metals otherwise lost to tuarine sediments. Upon entry into estuaries in er runoff a large portion of dissolved iron and anganese precipitate out of solution and accumu-e in sediments along with particulate fractions these metals. Most cadmium and copper in solu-n is transported through salt marsh estuaries hile particulate fractions are apparently lost to e sediments. All dissolved mercury and ap-rently a desorbable fraction of that in particulate atter is transported through the salt marsh stem. (See also W74-05502 thru W-74 05506) .napp-USGS)
74-05501

EAVY METAL FLUXES THROUGH SALT ARSH ESTUARIES,
idaway Inst. of Oceanography, Savannah, Ga.
. L. Windom.
idaway Institute of Oceanography Annual ogress Report (EPA Project No R-800372), Ap-ndix A, p 30-56, January 1974. 5 fig, 6 tab, 22 f.

escriptors: *Path of pollutants, *Heavy metals, Estuaries, *Water chemistry, *Atlantic Coastal ain, Mercury, Cadmium, Copper, Iron, Man-nese, Salt marshes, Water chemistry, Organic atter, Sorption, Chemical precipitation, spended load.

ie flux of heavy metals through salt marsh estua-s is controlled by processes which occur at ver-estuary and salt marsh-sediment boundaries. nese processes include adsorption-desorption actions, flocculation, precipitation and sedimen-tion. Along with estuarine circulation they effec-vely control the residence time of metals in tuaries. Some biological processes, such as up-ke by marsh vegetation, may serve as efficient echanisms to recycle metals otherwise lost to tuarine sediments. Upon entry into estuaries in ver runoff a large portion of dissolved iron and aganese precipitate out of solution and accumu-te in sediments along with the particulate forms these metals. Most cadmium and copper in solu-n is transported through salt marsh estuaries hile particulate forms are apparently lost to the diments. All dissolved mercury and apparently a sorbable fraction of that in particulate matter is ansported through the salt marsh system. (See so W74-05501) (Knapp-USGS)
74-05502

RGANIC AND INORGANIC GEOCHEMISTRY F SOME COASTAL PLAIN RIVERS OF THE OUTHEASTERN UNITED STATES,
eorgia Inst. of Tech., Atlanta. School of eophysical Sciences.
. C. Beck, J. H. Reuter, and E. M. Perdue.
idaway Institute of Oceanography Annual ogress Report (EPA Project No R800372), Ap-ndix B, p 57-118, January 1974. 5 fig, 5 tab, 80 f.

escriptors: *Path of pollutants, *Heavy metals, Estuaries, *Water chemistry, *Atlantic Coastal ain, Mercury, Cadmium, Copper, Iron, Man-nese, Salt marshes, Water chemistry, *Organic atter, Sorption, Chemical precipitation, spended load, *Georgia.
lentifiers: *Satilla River(Geo.).

In a comprehensive study of the distribution of organic and inorganic constituents in natural waters, the chemical compositions of several rivers flowing through the Coastal Plain of southeast Georgia (the Satilla River, in particular) have been investigated. These streams are generally characterized by low suspended load, low ionic strength, low pH values, and a predominance of organic over inorganic constituents. The dominance of sodium and chloride among inorganic ions indicates that rainfall is a major factor in determining the distribution of major elements in these waters. The low pH values and the relatively high concentrations of iron and aluminum appear to result from the high concentrations of organic matter. River water organic matter is chemically similar to soil fulvic acids. The dominance of organic matter over inorganic constituents and the resultant low pH values of these waters are in direct contrast with the chemical compositions of most of the rivers of the world which have been previously studied. (See also W74-05501) (Knapp-USGS)
W74-05503

CHEMICAL CHARACTERISTICS OF DISSOLVED ORGANIC MATTER IN RIVER WATER,
Georgia Inst. of Tech., Atlanta.
S. J. Martin.
Skidaway Institute of Oceanography Annual Progress Report (EPA Project No R-800372), Appendix C, p 119-170, January 1974. 7 fig, 6 tab, 32 ref.

Descriptors: *Path of pollutants, *Heavy metals, *Estuaries, *Water chemistry, *Atlantic Coastal Plain, Mercury, Cadmium, Copper, Iron, Manganese, Salt marshes, Water chemistry, Organic matter, Sorption, Chemical precipitation, Suspended load, *Georgia.
Identifiers: *Satilla River(Geo.).

Dissolved organic matter from the Satilla River, a Coastal Plain river of southeast Georgia, and a tributary swamp was studied by separation into chromatographically homogeneous fractions. The oxygen-containing functional group content of each fraction increases with decreasing molecular weight. Total acidity ranges from 7.3 to 12.9 meq/g, and carboxyl group content from 3.2 to 9.5 meq/g. River water organic matter close to a swamp source shows lower total acidity and carboxyl group content when compared to organic matter further downstream. Carbon ranges from 40.0% to 54.3%, hydrogen from 3.4% to 5.6%, nitrogen from 0.7% to 1.9%, and oxygen from 39.6% to 55.3%. The molecular weight of the unfractionated organic matter is 1322, and is in close agreement with the molecular weight of 1266 determined on the original material. The fraction with the highest molecular weight is similar to humic acid, but accounts for only a small portion of the total organic matter, the rest of which resembles fulvic acid. Humic substances of a rather narrow molecular weight range are leached from a swampy, low relief area. As they are transported downstream, the higher molecular weight portion is removed from solution by flocculation. The soluble organic matter remaining exerts control on the water chemistry of the river through exchange reactions with the inorganic constituents and through dissociation. Since the transportation and accumulation of toxic pollutants such as heavy metals is greatly influenced by their association with river water organic matter, the results of this study should be of interest to those concerned with environmental problems. (See also W74-05501) (Knapp-USGS)
W74-05504

A HYDROGRAPHIC INVESTIGATION OF WINYAH BAY, SOUTH CAROLINA AND THE ADJACENT COASTAL WATERS,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 2L.
W74-05505

AN IMPROVED ION-EXCHANGE TECHNIQUE FOR THE CONCENTRATION OF MANGANESE FROM SEA WATER,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5A.
W74-05506

EVALUATION OF PEATLAND WATER TABLE ELEVATION AND WATER QUALITY INDICATORS,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
For primary bibliographic entry see Field 7B.
W74-05517

THE OCCURRENCE AND DISTRIBUTION OF THE HYDROIDS OF THE GALVESTON BAY, TEXAS, AREA,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W74-05529

OIL IN SCOTTISH WATERS,
Office of Naval Research, London (England).
J. M. Leonard.
Available from NTIS, Springfield, Va 22151 as AD-766-432 Price $3.00 printed copy; $1.45 microfiche. Conference Report C-12-73, June 1973. 6 p.

Descriptors: *Oil spills, *Water pollution effects, *Water pollution treatment, *Conferences, Atlantic Ocean, Biodegradation.
Identifiers: *Scotland.

The petroleum discoveries in the northern North Sea and their implications for the ecology of Scotland's waters was the theme of the third annual meeting of the Scottish Marine Biological Association in Stirling. This is a 6-page summary of that meeting. The topics discussed include: exploration and production of North Sea oil, with reference to ecological aspects; problems of oil pollution and combating oil; use of oil dispersants; oil degradation by bacteria; hydrocarbons in the marine environment; and Littorina saxatilis as an index of dispersants. (Knapp-USGS)
W74-05551

CAESIUM-137 AS A WATER MOVEMENT TRACER IN THE ST GEORGE'S CHANNEL,
Institute of Oceanographic Sciences, Birkenhead (England).
For primary bibliographic entry see Field 2E.
W74-05555

PRIMER ON AGRICULTURAL POLLUTION,
C. P. Gratto, W. R. Webber, F. G. Viets, Jr., J. P. Law, and J. L. Witherow.
Journal of Soil and Water Conservation, (Vol 26), p 44-65, March-April 1971. 22 p, 5 tab.

Descriptors: *Agriculture, *Water pollution sources, *Farm wastes, Management, *Water quality, *Water conservation, Sediment, Fertilizer, Irrigation practices, Waste disposal, Fertilization, Crop production, Productivity, Water requirements, Soil treatment, Pesticide residues, Chemical wastes, Pollutants, Contamination(Water), Sedimentation, Sediment yield.

The five major groups of pollutants generated by agriculture are animal wastes, fertilizers, irrigation residues, pesticides, and sedimentation. Growing concern about animal waste treatment, use and disposal coincides with the public's concern about the overall problem of waste management and environmental quality. High density confinement of livestock compounds the problems of waste utilization or disposal. Environmentalists argue that since nitrogen and phosphorous are factors in eutrophication, nitrogen fertilizers contribute to

both surface and groundwater pollution. Evidence indicates the probable connection between water quality deterioration and increased fertilizer use. Water quality problems resulting from irrigation are primarily due to the fact that irrigation is a major water consumer. Plants extract water from the supply, resulting in a concentration of dissolved mineral salts, present in all natural waters. Irrigation also adds pollutants by leaching natural salts and other materials from the soil. Special attention must be given to the rates of accumulation of pesticides and their breakdown products in soil, to the extent of contamination of water resources. Sediment has a twofold environmental effect. It depletes the land resource from which it is derived and impairs the quality of water which it is deposited in. (Silber-Florida)
W74-05569

AQUATIC ANOMALIES: SYMPTOMS OF A SICK OCEAN,
Florida Conservation Foundation, Winter Park. Environmental Information Center.
B. Barada.
The Florida Naturalist, Vol 46, No 4, p 2-12, 1973. 13 photo.

Descriptors: *Water, *Water pollution, *Water pollution sources, *Environmental effects, Ecology, Marine animals, Marine biology, Marine fisheries, Shellfish, Algae, Nutrients, Oxygen, Oxygen demand, Toxicity, Water purification, Coasts, Oceans, Water pollution effects, Ecosystems, Wastes, Waste dilution.

A few years ago a study was begun of aquatic anomalies regarding destruction and deterioration of fisheries, shellfish beds, habitats of sea birds and unexplained algal blooms. Practically all of these aquatic anomalies are directly or indirectly associated with pollution. The criteria for evaluating the extent and degree of marine pollution are inadequate, since they are based on the fallacy that the ocean has an unlimited capacity to dilute waste water effluent without harm to the marine ecosystem. The quality of receiving waters is measured in terms of biological oxygen demand, dissolved oxygen and coliform bacteria counts, all of which theoretically determine if the water is receiving a greater quantity of nutrients than its natural purification processes can handle. Usually, however, if there is sufficient dissolved oxygen in the water, the water is classified as not badly polluted. Many toxic persistent compounds do not become diluted, but rather accumulate in the ecosystem, and can be lethal to marine flora and fauna. Florida's marine resources are particularly vulnerable because the toxic effects of practically all marine poisons and diseases are exaggerated in warmer waters. (Ritchie-Florida)
W74-05572

A SMALL OIL SPILL,
Woods Hole Oceanographic Institution, Mass.
M. Blumer, H. L. Sanders, J. F. Grassle, and G. R. Hampson.
Environment, Vol 13, No 2, p 2-12, March 1971. 2 map, 2 photo.

Descriptors: *Oceans, *Water pollution sources, *Oily water, *Oil wastes, *Aquatic life, Industrial wastes, Sea water, Contamination, Aquatic environment, Waste discharge, Wastewater disposal, Chemical wastes, Food, Food chains, Fishlife, Water pollution effects, Fishkill, Pollutants, Toxins, Water quality, Impaired water quality, Coasts.

Oil pollution of the ocean is an increasingly serious global problem. The oils in petroleum are different in composition and toxicity from those occurring naturally in living marine organisms. These differences present a threat to ocean life and ultimately to human welfare, particularly in view of the scope of the pollution. Scientists point out that the major catastrophes such as tanker wrecks receive the headlines, but the smaller day-to-day spills in coastal waters and harbors of the world produce chronic pollution much larger in volume and probably more severe in biological consequences. Chronic oil pollution contaminates nearshore waters that are the key to the survival of most marine animals that are taken for man's food. Over a long period of time, this persistent pollution may interfere with the normal life processes of the organisms--as well as killing them outright at high concentrations. The result may be progressive disappearance of usually abundant fish and shellfish. Their decline would be accompanied by an increase in pollution-tolerant species that generally indicate an unhealthy state of biological affairs. Furthermore, remaining organisms of food value to man may be permanently contaminated with petroleum hydrocarbons that could be hazardous to health. (Silber-Florida)
W74-05578

DIFFUSION OF CATTLE MANURE SOLUTION THROUGH A WET POROUS STRATUM WITH REACTION,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
S. K. Choi, L. T. Fan, L. E. Erickson, and R. I. Lipper.
Water Air Soil Pollut. Vol 1, No 4, p 390-404. 1972. Illus.
Identifiers: *Diffusion, *Manure(Cattle), *Mathematical models, Pollution, Porous media, Solution, Stratum, Water pollution sources, *Chemical oxygen demand.

A processing governing the transport rate of cattle manure as measured by COD through a wet porous stratum is investigated under simulated conditions. A mathematical model of the system is presented. The model simulates diffusion and biological reaction processes taking place simultaneously in the system. Experimental observations determine the diffusion coefficient and the biological reaction rate constant of the cattle manure solution. Values of approximately 6,760,000 sq cm/5 for the diffusion coefficient and 0.0305/day for the reaction rate constant at the temperature of 25 plus or minus 2C are obtained. For the system with a known diffusion coefficient and reaction rate constant, the analytical expressions can be used to approximately evaluate or predict the rates that animal wastes will contaminate surface water, soil or ground water.--Copyright 1973, Biological Abstracts, Inc.
W74-05591

RESULTS OF MONITORING FOR TRITIUM INCORPORATION AT THE KARLSRUHE NUCLEAR RESEARCH CENTER IN 1971 AND 1972, (ERGEBNISSE DER TRITIUM-INKORPORATIONSUBERWACHUNG IM KERNFORSCHUNGSZENTRUM KARLSRUHE IN DEN JAHREN, 1971-1972),
Kernforschungszentrum, Karlsruhe (West Germany).
For primary bibliographic entry see Field 5A.
W74-05613

BIOLOGICAL MANAGEMENT AND CONSERVATION: ECOLOGICAL THEORY, APPLICATION AND PLANNING,
For primary bibliographic entry see Field 6G.
W74-05622

SOME ECOLOGICAL EFFECTS OF DISCHARGED SUGAR MILL WASTES ON MARINE LIFE ALONG THE HAMAKUA COAST, HAWAII,
Hawaii Univ., Honolulu. Inst. of Marine Biology.
For primary bibliographic entry see Field 5C.
W74-05660

ON THE NECESSARY AND SUFFICIENT CON DITIONS FOR A LONG-TERM IRRIGATE AGRICULTURE,
Economic Research Service, Davis, Calif. Far Production Economics Div.
C. V. Moore.
Water Resources Bulletin, Vol 8, No 4, p 802-81 August, 1972. 3 fig, 12 ref.

Descriptors: *Water quality, *Irrigation effect *Salinity, Salt balance, Irrigation practices, Wat management(Applied), Drainage, Water pollutio sources, Soil analysis, Soil chemical properties, I rigated land, Irrigation water.

Salinization and water logging have been th nemesis of irrigated agriculture societies. Lo quality water substitutes for high quality water f irrigation at an increasing rate up to the limits the soil's ability to transmit the additional wat and remove excess salts from the root zone. So transmissibility can be increased by additional i vestment in drainage ditches and underground til Low valued high salt tolerant crops can be sul stituted for higher valued salt sensitive crops t maintain production in areas served by irrigatio water sources of deteriorating quality. Thus phys cal factors specify the necessary conditions f survival of an irrigated agriculture. The conditio for survival must be in terms of a positive net i come in each subplanning period discounted to i present value. (Skogerboe-Colorado State)
W74-05663

MOVEMENT OF NITRATES UNDER IR RIGATED AGRICULTURE,
Nebraska Univ., Lincoln. Coll. of Engineering ar Architecture.
D. M. Edwards, P. E. Fischbach, and L. L. Youn Transactions of the ASAE (American Society Agricultural Engineers), Vol 15, No 1, p 73-7 January-February, 1972. 6 fig, 14 ref.

Descriptors: *Nitrates, Nitrogen, *Water pollutio sources, Leaching, Water quality contro Nutrient removal, Fertilizers, *Nitrogen con pounds, *Path of pollutants.

Nitrate nitrogen is highly soluble in water, there b posing a threat of water pollution. A coordinate sequence of laboratory and field studies were co ducted. Both mechanical placement and hydraul injection were used to apply the fertilizer. The fo lowing conclusions were drawn: 1. once nitrat move below the soil surface they do not re-ent the runoff water; 2. nitrates move with the wettin front; 3. with a properly managed irrigation syste little or no movement of nitrates outside the ro zone should occur. (Skogerboe-Colorado State)
W74-05666

WATER-LEACHABLE NUTRIENTS FRO FROZEN OR DRIED PRAIRIE VEGETATION,
South Dakota State Univ., Brookings. Dept. Plant Science.
E. M. White.
J Environ Qual. Vol 2, No 1, p 104-107, 1973. Illus
Identifiers: Dried ground, Frozen groun Minerals, *Nutrients, *Prairies, Runof *Vegetation, Water quality, *South Dakot Leaching.

Runoff from agricultural lands in South Dakota mainly from melting snow and spring rain Nutrient enrichment of this water may b enhanced during the fall and winter by the ruptu ing of plant cells by freezing. Native prairi vegetation and mulch were sampled in la summer, early fall, and spring to determine the e fect freezing, in comparison to drying, would hav on nutrient release to water. Release of Ca, Mg, K P, NO3-N, NH4-N by freezing was related t stage of growth or decomposition of the vegeta tion. Freezing increased nutrient release if th vegetation were growing when it was frozen. So genesis, ecological relations between plant spe

s, and runoff water quality could be affected by relative release of different kinds of nutrients.- opyright 1973, Biological Abstracts, Inc.
74-05696

ARINA DEL REY: COMPUTER SIMULATION POLLUTANT TRANSPORT IN SEMI-ENOSED WATER BODY,
iversity of Southern California, Los Angeles. ean Engineering Program.
G. Brandsma, J-J Lee, and F. R. Bowerman.
ailable from NTIS as COM 73-11863, $4.25 per copy, $1.45 microfiche. Sea Grant Publican No. USC-SG-1-73, June 1973. 113 p, 21 fig, 1 , 35 ref, 3 append. NOAA SG 04-3-158-45.

scriptors: *Tides, *Pollutants, Marinas, imulation analysis, *Dispersion, California, mputers.
ntifiers: *Tidal flushing, Marina del Ray(Calif).

lal flushing characteristics of Marina del Rey re investigated by computer simulation. cause of the special geometry of Marina del Rey ich can be approximated by one-dimensional gments, the model developed by Fischer (a thod of Predicting pollutant Transport in Tidal aters, a University of Calif. at Berkeley, Water sources Center Contribution No. 132, 1970) is ed for the simulation process. A mass-conservan equation is used with tidal data to compute al flows. Dispersion of pollutants between fluid ments is calculated using a modified Elder's uation for dispersion in wide open-channel flow. ne proceeds in a series of finite steps, each of ich has a convective part and a dispersive part. ta for the program are provided from tide cordings made at various points in the marina. e results show comparative flushing characristics for pollutants discharged at various locans in Marina del Rey. The most striking characristic of the marina is its sensitivity to variations locations and time of pollutant injections. The in channel has a great deal more flushing activi than the basins. The timing of pollutant injecns relative to tidal phases is very important in termining what percentage of material will be shed out in a given time. (Sinha - OEIS)
74-05698

HARACTERISTICS OF CONDENSER WATER SCHARGE ON THE SEA SURFACE ORRELATION OF FIELD OBSERVATIONS ITH THEORY),
assachusetts Inst. of Tech., Cambridge.
r primary bibliographic entry see Field 5A.
74-05700

MODEL OF A NUTRITIONAL ECOSYSTEM O CONSERVE NUTRIENTS FOR MAN,
ashington State Univ., Pullman. Dept. of Animal ience.
P. Kromann.
ltr Rep Int. Vol 7, No 1, p 33-43, 1973, Illus.
entifiers: Algae, Animals, Conservation, cling, *Ecosystem(Nutritional), Fauna, Fish, ora, Model studies, *Nutrients, Pollution, Rumints, *Recycling.

model of a nutritional ecosystem is described as system of recycling nutrients in an ecological, osed' system. It is an integration of several tural ecosystems which would utilize the 'waste oduct nutrients' of man. The ecosystem could minate these nutrients from polluting environental air and water, thereby conserving energy, otein, vitamins and minerals which are needed nourish a growing and hungary population. The trients would be conserved by simple mached and ruminant animals, plants, croflora (algae), microfauna and fish. The trients of these plants and animals would be utiled by man, other animals or plants. Nutrients in e excrement of animals would also be recycled. on-polluted water (possibly potable water) and O2 would also be obtained from this system.--Copyright 1973, Biological Abstracts, Inc.
W74-05704

THE INTERDEPENDANCE OF MARINE AND ESTUARINE ECOSYSTEMS IN SOUTH AFRICA,
Natal Univ., Durban (South Africa). Oceanographic Research Inst.
A. E. F. Heydorn.
S Afr J Sci. Vol 69, No 1, p 18-24, 1973, Illus.
Identifiers: Depletion, *Ecosystems, *Estuarine environment, Eutrophication, *Marine environment, Oxygen, Poison, Salinity, Silt, *South Africa(Natal), Hydrogen ion concentration.

The main features of the ecology of the coastal regions of Natal are described to illustrate that the terrestrial and marine ecosystems cannot be placed into 2 separate compartments. Estuaries in particular represent areas of overlap of land and sea, and life in them is therefore exceptionally rich. The wide range of organisms living in them in a state of interdependence renders estuaries vulnerable to man-induced environmental changes which can upset the natural equilibrium. Such changes can be in the form of siltation, eutrophication, O2 depletion, poisoning, or the upsetting of salinity balances of pH-levels. Most of these phenomena can be illustrated by Durban Bay or St Lucia. It is also clear that these organisms do not distinguish between individual estuaries but depend upon Natal's estuarine environment as a whole. Coastal currents and water movements provide effective longshore transport mechanisms for a multitude of planktonic and other drifting forms of life including juvenile fish and prawn larvae. Thus the deterioration of Durban Bay and St. Lucia should not be regarded as 2 independent events, nor will the development of Richards Bay as a major harbor merely be of local ecological consequence.--Copyright 1973, Biological Abstracts, Inc.
W74-05713

A FACTOR ANALYSIS OF SELECTED WATER QUALITY VARIABLES IN CENTRAL NEW JERSEY DURING 1960-1969,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Geography.
R. M. Hordon.
Paper No H-58, presented at 53rd Annual Meeting of the American Geophysical Union, Hydrology Section, April 17-21, 1972, Washington, D.C., 22 p, 3 fig, 7 tab, 18 ref.

Descriptors: *Urbanization, *New Jersey, *Water quality, *Statistical methods, Correlation analysis, Computer programs.
Identifiers: *Factor analysis, *Raritan River Basin(N.J.).

Spatio-temporal changes in water quality in central New Jersey during 1960-69 were studied by a factor analytic methodology. The period included suburbanization with its resultant impact on watershed quality and periodic events such as the record drought of 1962-66. Eleven variables were available at each of three stations: temperature, pH, DO, turbidity, BOD, color, alkalinity, hardness, bacteria, discharge, and percent saturation. The factor structures generally reveal the following characteristic pattern: (1) an oxygen-status factor, represented by high loadings on temperature, DO, and BOD; (2) an appearance factor based on turbidity, color, and discharge; and (3) a third variable factor, loading occasionally on percent saturation. The oxygen-status factor tends to be the component of greatest statistical importance. Bacteria, hardness, pH, and alkalinity generally exhibit the lowest loadings of any of the 11 variables. Indeed, bacteria is the least related to any of the other variables in the data set. The cumulative degree of explanation of the rotated factors declined during the decade, suggesting an increase in independence developing among the variables. It is hypothesized that urbanization with its associated changes in land use and runoff patterns might be intervening in the natural ecology of the stream. The effects of urbanization, then, would be to interfere with in-stream interactions among the variables. The 30 factor structures were quantitatively compared by using a computer program called RELATE. The procedure was to compare structures based on identical sets of variables from year to year for the same station and from basin to basin for the same year. The results for the Raritan River watershed indicate that intrabasin and interbasin similarities outweigh the differences and that the factor structures evidence a high degree of stability during the decade of the 1960's. (Knapp-USGS)
W74-05716

WATER POLLUTION,
Robert S. Kerr Water Research Center, Ada, Okla.
W. C. Galegar.
In: Environmental Aspects of Geology and Engineering in Oklahoma; Proceedings of a Symposium of the Oklahoma Academy of Science, December 4, 1970, Stillwater: Annals of the Oklahoma Academy of Science, No 2, p 9-14, 1971. 2 ref.

Descriptors: *Water pollution control, *Oklahoma, Federal Water Pollution Control Act, Grants, Research and development, Corrosion, Fishkills, Thermal pollution, Treatment facilities.

In Oklahoma, the use of waters for industrial and municipal purposes has brought many problems. Among these are thermal stratification in lakes. Stratification in Keystone Reservoir caused oxygen-deficient zones that resulted in excessive corrosion as well as fish kills. Extremely high concentrations of minerals in Foss Reservoir are a result of both severe drought conditions in the impoundment area and a high evaporation rate. Other problems are pollution from industries, resulting in adverse conditions for aquatic life, and pollution by municipal wastes. The Environmental Protection Agency's most important contribution for clean water is a program of grants to municipalities for the purpose of providing adequate waste-treatment facilities. Also important are a research program to determine improved and more economical methods for controlling and treating wastes, and personnel assistance to various State and local agencies. (Knapp-USGS)
W74-05740

EROSION CONTROL,
Soil Conservation Service, Stillwater, Okla.
For primary bibliographic entry see Field 2J.
W74-05741

NATURAL CHLORIDE POLLUTION, ARKANSAS AND RED RIVER BASINS,
Army Engineer District, Tulsa, Okla.
M. W. DeGeer.
In: Environmental Aspects of Geology and Engineering in Oklahoma; Proceedings of a Symposium of the Oklahoma Academy of Science, December 4, 1970, Stillwater: Annals of the Oklahoma Academy of Science, No 2, p 42-46, 1971.

Descriptors: *Water pollution control, *Brines, Texas, Oklahoma, Salts, *Chlorides, Saline water.
Identifiers: *Arkansas River basin, *Red River basin.

Natural chloride pollution occurs in the Arkansas and Red River basins. A control program has the objective of making the waters of these basins usable at points of need. Two salt source areas were chosen for supplemental field studies including exploration and experimental test facilities. Work at the first area, the Great Salt Plains, provided detailed information on the general geology,

source of the pollution, and nature of the brine emission. Experimental work includes testing the impoundment of freshwater over saline soils. Remote sensing was used in crop and groundwater studies. For the second area, on Jonah Creek in Childress County, Texas, plans call for a subsurface collection system, deep-well injection, evaporation-rate studies, preinjection treatment of brines, and seismic monitoring for earthquakes. (Knapp-USGS)
W74-05742

LANDSLIDES AND RELATED PHENOMENA PERTAINING TO HIGHWAY CONSTRUCTION IN OKLAHOMA,
Oklahoma State Dept. of Highways. Research and Development Div.
For primary bibliographic entry see Field 2J.
W74-05743

A FOUL TIDE,
R. Burton.
Sea Frontier, Vol 18, p 238-246, July 1972. 1 map, 5 photo.

Descriptors: *Oil wastes, *Water pollution sources, *Sewage effluents, *Aesthetics, Eutrophication, *Fish kill, Fouling, Agricultural chemicals, Industrial wastes, Phenols, Oxygen sag, Stagnant water, Water pollution effects, Toxicity, Waste water treatment, Economic aspects, *Water pollution control, Water quality, Wastes, Biodegradation, Ships.
Identifiers: *Rhine River.

Water pollution sources in densely populated areas of the world are discussed. Stagnant waters such as ditches, canals, and lakes can become grossly polluted by indiscriminate waste disposal. Even rivers can become so polluted that oxygen levels fall below that needed to sustain life. The Rhine is believed to contain as much oil pollution as was caused by the Torrey Canyon disaster. Not only is waste oil discharged into the Rhine, but large quantities of sewage enter the river each day. Rotterdam and the Haque obtain drinking water from the Rhine, and have found it necessary to construct reservoirs which trap water during the less polluted winter. The polluted Rhine water, after entering the North Sea, mixes with coastal waters dangerously close to fish nursery grounds. Chemical pollution in the Rhine has already destroyed a million dollar fishery for the Tubifex worm (aquarium food). The first major prosecutions for Rhine pollution concerned the release of 8,650 tons of caustic soda waste. Professor Korringa of the Netherlands Institute made several recommendations for curbing pollution in the Rhine: (1) treating seawage before discharge into coastal waters, (2) severe penalties for oil polluters, (3) the incineration of persistent chemicals and pesticides, (4) replacement of mercury, and (5) inoffensive dumping in areas with strong currents. (Sperling-Florida)
W74-05793

ADD SALT TO TASTE,
Habitat, Inc., Belmont, Mass.
H. H. McConnell, and J. Lewis.
Environment, Vol 14, p 38-44, November 1972. 3 photo, 37 ref.

Descriptors: *Sodium chloride, *Deicers, *Snow removal, Lakes, Rivers, Wildlife, Vegetation, Solubility, Dispersion, Percolation, Leaching, Water quality, Water pollution sources, Potable water, Porosity, Soil physical properties, Eutrophication, Drainage, Calcium chloride.

Nine million tons of salt were used in 1970 to clean snow from highways. These quantities of salt have adverse effects on public drinking water supplies, wildlife, vegetation, lakes, and rivers. A mixture of calcium chloride and sodium chloride lowers the freezing point of the brine solution and breaks the bond between ice and road. The danger is that high concentrations of salts may overload dispersal mechanisms. It is estimated that 25 to 50 per cent of the salt infiltrates to the groundwater. High runoff contaminates many shallow wells and can also affect wildlife by disturbing body processes. Salt in water supplies may be harmful to people with heart disease or those on low salt diets. Saline soil water will inhibit the plants intake of water and make soil less permeable. Substantial losses of roadside trees have occurred. Salt may also disrupt the vertical mixing in lakes and ponds through density stratification and degrade fish environments. (Sperling-Florida)
W74-05795

A DOUBLE MARINE DISASTER,
A. J. Nathan.
Sea Frontiers, Vol. 18, No. 4, p. 202-209, July-August 1972. 7 photo.

Descriptors: *Water pollution, Oil, Environment, *Environmental effects, Ships, Breeding, *Oil spills, Oil pollution, Ecology, Aquatic habitats, Shoals, Coasts, Fish, Food chain, Birds, Shore birds.
Identifiers: *South Africa(Cape Agulhas), *Penguins.

The 1971 sinking of the Wafra, a Liberian registered, American owned oil tanker threatened to be the worst disaster of its kind since the wreck of the Torrey Canyon. Running aground at Cape Agulhas, the tanker posed a threat to the nearby Dyer Islands, principal breeding grounds of the black-footed penguin. Already a diminishing species, the penguins are important to the ecology of the sea since they deposit their excreta (guano) into the water, which produces nitrogen for the phytoplankton upon which small fish feed. Shoals of pilchard then develop, which are in turn eaten by birds, humans and larger fish. It is important therefore that the shoals are sufficiently large to maintain the ecological cycle. A marine court of inquiry, while absolving the parties of blame for the incident, noted that if a deep-sea salvage tug had been available when the Wafra first encountered difficulty, the pollution probably could have been avoided. (Ritchie-Florida)
W74-05800

SUPERIOR-MICHIGAN-HURON-ERIE-ONTARIO: IS IT TOO LATE,
For primary bibliographic entry see Field 5G.
W74-05801

UNDERGROUND NUCLEAR TESTING PROGRAM, NEVADA TEST SITE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Division of Environmental Affairs (AEC), Washington, D.C.
Available from National Technical Information Service, Springfield, Va, 22151, as EIS-NV-73-0798-F, for $9.00 paper copy, $1.45 microfiche. April 1973. 121 p, 4 fig, 1 map, 1 photo, 3 append.

Descriptors: *Environmental effects, *Nuclear explosions, Craters, *Underground, *Water pollution sources, Radioactive wastes, Ecosystems, Plant growth, Terrestrial habitats, *Nevada, Federal government, Research priorities, Fresh water.
Identifiers: *Environmental Impact Statements, *Northern Yucca Flat(Nev).

No significant adverse effects on the environment are anticipated as a result of the Atomic Energy Commission's underground nuclear testing program. The probable impact on the environment due to continued underground nuclear testing at the site will be small. A large amount of radioactive matter will be created in the underground cavities formed by the nuclear detonations. The terrestrial ecosystem will be affected by testing due to the creation of new subsidence craters. There is a slight chance of localized onsite effects to plant life. Local freshwater systems will not be significantly affected by additional radioactivity derived from execution of the proposed test program. Slight adverse environmental effects cannot be avoided. (Daniels-Florida)
W74-05811

PAPER'S POLLUTION PROBLEMS,
H. V. L. Bloomfield.
American Forests, Vol 77, p 10-13, 41-43, November 1971. 3 photo, 3 chart.

Descriptors: *Pulp wastes, *Wood wastes, *Paper industry, *Pulp and paper industry, Chemical wastes, Organic wastes, Water pollution sources, Waste water treatment, Water reuse, Environmental sanitation, Costs, Economic feasibility, Financial feasibility, Industries, Biological treatment, Water pollution treatment, Recycling, Odor, Air pollution.

The total waste load originating from the paper industry represents twenty-seven percent of the total pollutional load from manufacturing. Per capita paper and paperboard consumption is five hundred and seventy-three pounds per year. Paper industries lead all other industries on expenditure for pollution. By 1969 eighty percent of the facilities had some kind of waste water facility. Mills responsible for forty-one percent of the total output gave their wastewater secondary treatment. However ten percent of the mills now in operation can never meet any anti-pollution standards. The wastes of the pulp and paper industry, except for odor, are biodegradable. The industry's pollution comes from dumping too much of these harmless materials, too much for nature to handle. Extensive re-cycling has been proposed, but its chief value seems to be in anti-littering. About twenty percent of paper output is recycled, but the flushing out of the inks and coatings adds to paper mill pollutions. So far there is no known way to get rid of the pulping odor. As little as one to twenty parts per billion of air can be detected. Systems that make progress toward ending this pollution are prohibitively expensive. (Sperling-Florida)
W74-05817

THE MIXING CHARACTERISTICS OF SUBMERGED MULTIPLE-PORT DIFFUSERS FOR HEATED EFFLUENTS IN OPEN CHANNEL FLOW,
Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
J. R. Argue.
Available from the National Technical Information Service as PB-230 243 $10.00 in paper copy, $1.45 in microfiche. M Sc Thesis, May 1973. 124 p, 26 fig, 16 tab, 32 ref, 3 append. OWRR A-040-IA (1).

Descriptors: *Jets, *Mixing, *Diffusion, *Dispersion, Heated water, *Thermal pollution, Hydraulic models, *Path pollutants, Waste water(Pollution), Stratified flow, Outlets, *Open channel flow.

The behavior of heated water jets discharging into a shallow, co-flowing environment was studied in a model which simulated the flow of cooling water from a prototype multiport diffuser discharging into a river or ocean current. The relative effect of jet interaction and surface distortion were considered. The port spacing distance was the most significant variable. Criteria for differentiating among well-mixed flows, moderately well-mixed flows and stratified flows were determined together with the relationship between mixing and distance. A procedure for designing multiport diffuser installations is suggested. (See also W74-05822) (Knapp-USGS)
W74-05821

ERTICAL MIXING OF HEATED EFFLUENTS N OPEN-CHANNEL FLOW,
owa Univ., Iowa City. Dept. of Mechanics and lydraulics.
. J. Schiller.
vailable from the National Technical Informaon Service as PB-230 212 $11.50 in paper copy, 1.45 in microfiche. Ph D Thesis, July 1973. 146 p, l fig, 5 tab, 30 ref, 2 append. OWRR A-040-IA ').

escriptors: *Thermal pollution, *Mixing, Heated water, Hydraulic models, Mathematical iodels, Path of pollutants, Turbulent flow, Turbunce, Stratified flow, Water temperature, Disperon, Diffusion, Computer programs, *Open chanel flow.

method for prediction of vertical mixing of eated surface effluents in the far-field mixing reon was studied using laboratory flume experients which covered a range of flows from well ixed to nearly stable stratified conditions. The elocity and depth of flow, as well as the temperare difference and discharge ratio between amient and effluent flows were varied to simulate ie range of conditions commonly encountered. emperatures were recorded downstream by moile thermistors. Velocity measurements were also ken for selected runs. From the data together ith an analysis based on the convection-diffusion quation, it is possible to determine (1) the istance for nearly complete mixing, (2) a bulk ixing coefficient for moderately and rapidly mixg flow and (3) the vertical distribution of the verall vertical heat transfer coefficient at cross ctions downstream. The buoyancy effects were sorbed into the transfer coefficient. The less ense water inhibits mixing near the surface, and eates reduction in mixing throughout most of the epth for the more stratified flows. For the rapidly ixing flows, the vertical heat transfer coefficient greed closely with the turbulent momentum ansfer coefficient. Predictions of the ownstream temperature profiles were obtained sing a finite difference representation of the eady state convection-diffusion equation. The redicted profiles agreed closely with the experiental ones. (See also W74-05821) (Knapp-USGS) 74-05822

HREE-DIMENSIONAL TURBULENT DIFFUION FROM POINT SOURCES OF THERMAL OLLUTION IN A RECTANGULAR OPEN HANNEL,
elaware Univ., Newark. Dept. of Chemical Enneering.
. C. Prieve.
vailable from the National Technical Informaon Service as PB-230 220 $18.50 in paper copy, .45 in microfiche. Master of Chemical Engineerg Thesis, May 1973. 293 p, 35 fig, 18 tab, 69 ref, 9 pend. OWRR A-015-DEL (2).

escriptors: *Heat transfer, *Path of pollutants, ixing, *Dispersion, *Diffusion, Turbulent flow, hermal pollution, Convection, Mass transfer, pen channel flow.

me simple forms of turbulent constitutive relans, which have been useful in pipe flows, are plied to the case of turbulent flow in a rectangur open channel. Procedures are given for extractg the constitutive parameters from the measured locity or temperature field. Thermal profiles sulting from a concentrated source of heat cated well away from the boundaries may be scribed by assuming a direct proportionality tween the turbulent energy flux and the timeeraged thermal gradient. The proportionality nstant, or eddy conductivity, must be allowed to sume a different value for each of the three ergy flux components, but variations with posin may be ignored. Incorporating this constitue equation with the energy equation, and glecting axial diffusion, the product of eddy nductivity and distance from the source is uniquely and predictably related to the variance of the time-averaged temperature profile along an axis appropriate to that conductivity component. This allows the determination of both cross-sectional components of the apparent eddy conductivity, using the minimum number of local temperature measurements necessary to establish both variances. Comparison of the momentum diffusivity with the thermal diffusivities reveals these two quantities to be of nearly the same magnitude. (Knapp-USGS)
W74-05823

HYDRAULICS AND THERMAL DISPERSION IN AN IRREGULAR ESTUARY,
General Electric Co., Philadelphia, Pa. Re-Entry and Environmental Systems Div.
R. R. Boericke, and D. W. Hall.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY1, Paper 10282, p 85-102, January 1974. 11 fig, 10 ref, append.

Descriptors: *Dispersion, *Path of pollutants, *Estuaries, *Thermal pollution, Mixing, Tides, Tidal waters, Thermal powerplants, Water temperature, *Mathematical models, Diffusion, Finite element analysis, Open channel flow, Model studies.

A model of thermal pollution in an irregular estuary is based on the open-channel hydraulics equations in two dimensions. Coordinate transformation is used to map the irregular shoreline into a rectangular computational space, thereby simplifying treatment of boundary conditions. The hydraulic flow field is calculated separately from the temperature field, due to the large difference in stable step size for the two calculations. The results of the hydraulics calculation, which become periodic after about one and one-half tidal cycles, are stored on magnetic tape for use in the temperature calculation. The temperature field arising from a powerplant thermal discharge requires 15 or more tidal cycles to become periodic, due to the gradual diffusion of heat away from the outfall by oscillating tidal currents. Sample temperature calculations are presented which illustrate the effect of the oscillatory tidal flow on the temperature distribution near the outfall. (Knapp-USGS)
W74-05828

LONGITUDINAL DISPERSION IN SATURATED POROUS MEDIA,
California Univ., Davis. Dept. of Water Science and Engineering.
M. A. Marino.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY1, Paper 10296, p 151-157, January 1974. 3 fig, 5 ref, append.

Descriptors: *Path of pollutants, *Groundwater movement, *Dispersion, *Porous media, Equations, Saturated flow, Equations, Water pollution sources, Seepage.

Analytical solutions were developed for two problems of longitudinal dispersion within semi-infinite, nonadsorbing, homogeneous, isotropic media in unidirectional flow fields. The source concentrations consist of variable inputs of contaminants. The solutions predict the distribution of contaminants resulting from the variable source concentrations. Two numerical examples are presented. (Knapp-USGS)
W74-05832

DIFFUSION AND DISPERSION IN OPEN CHANNEL FLOW,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
A. C. Miller, and E. V. Richardson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY1, Paper 10298, p 159-171, January 1974. 8 fig, 2 tab, 13 ref, append.

Descriptors: *Diffusion, *Dispersion, *Open channel flow, *Path of pollutants, Mixing, Turbulence, Flow resistance.

The relationships of lateral turbulent diffusion and longitudinal dispersion coefficients to the parameters that make up the structures of flows were studied experimentally. The resistance to flow for these runs varied from 10.6 to 4.4. The relation for the lateral turbulent diffusion coefficient was not affected by the secondary circulation that was present in all of the flows and is the same as that for a large range of flow conditions. The dispersion coefficient varied with resistance to flow and the average velocity. Longitudinal diffusion, which depends on the turbulence of the flow, was an insignificant factor in the dispersion coefficient as compared to the distribution of the local mean velocity in the lateral and vertical direction. (Knapp-USGS)
W74-05833

NORFOLK HARBOR DISPOSAL STUDY: HYDROGEOLOGIC STUDY OF NANSEMOND CITY DISPOSAL AREA.
Army Engineer District, Norfolk, Va.
April 1973. 10 p, 3 fig, 13 ref, 3 append.

Descriptors: *Hydrogeology, *Atlantic coastal plain, *Virginia, *Spoil banks, *Dredging, Water pollution control, Harbors, Groundwater.
Identifiers: Nansemond(Va), *Norfolk Harbor(Va).

The Craney Island Disposal Area established in 1953 to contain Norfolk Harbor dredge spoil will be filled to capacity within 10 years. At that time an additional spoil area will be needed for disposal of dredge spoil from maintenance dredging of Norfolk Harbor. Current environmental standards prohibit the disposal of contaminated dredge spoil in open waters. Consequently, the Norfolk District is studying viable disposal alternatives including disposal on low-lying ground in Nansemond City. The feasibility of using the Nansemond City Disposal Area was studied by defining the hydrogeology of the area. The study is also required to provide engineering data needed for design of pollution control measures, if required, to maintain the freshwater environment. The study area is located on the Atlantic Coastal Plain, a gently seaward sloping lowland characterized by a series of lowland flats and scarps that rise westward from the sea. The Coastal Plain is underlain by a series of unconsolidated sands and clays which range from Cretaceous to Recent. These sediments vary considerably in character over wide areas. They are usually covered by a few feet of peat. Many small lenses of sand function as shallow groundwater aquifers and domestic water supply for the surrounding area. These Pleistocene sediments, from 25 to 50-feet thick, are underlain by 150 to 200 feet of late Miocene, Yorktown Formation, shallow marine sediments. These sediments contain beds of silt and clay which are very low in permeability and function as confining beds for the Pleistocene aquifers above. (Knapp-USGS)
W74-05847

PERMEATION OF UNCHARGED ORGANIC MOLECULES AND WATER THROUGH TOMATO ROOTS,
Department of Agriculture, South Perth (Australia).
For primary bibliographic entry see Field 3F.
W74-05852

VORTEX CONTAINMENT OF SUBMERGED JET DISCHARGE,
Connecticut Univ., Storrs. Dept. of Mechanical Engineering.

For primary bibliographic entry see Field 8B.
W74-05912

THE SPREADING AND TRANSPORT OF OIL SLICKS ON THE OPEN OCEAN IN THE PRESENCE OF WIND, WAVES, AND CURRENTS,
Avco Corp., Wilmington, Mass. Avco Space Systems Div.
G. A. Waldman, R. A. Johnson, and P. L. Smith.
Available from NTIS as AD-765 926, $3.75 paper copy, $1.45 microfiche. Final Report No AVSD-0068-73-RR, July 1973. 70 p, 25 fig, 5 tab, 33 ref. DOT-CG-20, 617-A.

Descriptors: *Oil spills, *Oil pollution, Dye releases, Turbulence, Models, Winds, Waves(Water), Currents(Water), Ocean waves, Ocean currents, *Pollutants.
Identifiers: Spreading, Oil slick transport, Pollutant transport.

Calculations have been made of the spreading and transport of oil slicks on the open ocean. New and available results have been used for the spreading of oil on calm waters, and Okubo's correlation of dye-release experimental data has been invoked for the spreading caused by water turbulence. In the presence of combined effects of spreading and transport by various environmental influences, a simple superposition model has been employed. Limited comparisons of the results of these calculations have been made with data from the San Clemente and Arrow spills, and the Chevron and Santa Barbara leaks. Insufficient data on winds, waves, and currents and lack of knowledge of the rates of dispersion caused by surface turbulence and the evaporation of volatile components, as well as the limitations of the present analytical models regarding coupled spreading and transport effects, preclude making definitive calculations and comparisons. Presently available analytical and experimental results can be applied to predict oil slick spreading and transport under many conditions, but further work is needed to more precisely define the limits of validity of these methods. (Sinha-OEIS)
W74-05919

BREAKDOWN OF BENZO(A) PYRENE BY MICROORGANISMS IN WASTE WATERS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
M. N. Poglazova, A. Ya., Khesin, G. E. Fedoseeva, M. N. Meisel', and L. M. Shabad.
Dokl Akad Nauk SSSR SER Biol. Vol 204, No 1, p 222-225. 1972.
Identifiers: Microorganisms, *Pyrenes, Waste waters, Water pollution sources, *Industrial wastes, *Aromatic hydrocarbons, *Degradation(Decomposition).

The microflora of industrial waste polluted with polycyclic aromatic hydrocarbons (PAH), including benzo(a)pyrene, can break down large quantities of these hydrocarbons. Consequently, aromatic compounds are constantly being naturally decomposed in waste waters. The breakdown of PAH by microflora of waste waters can apparently be intensified by adding cultures of microorganisms actively oxidizing PAH.--Copyright 1973, Biological Abstracts, Inc.
W74-05943

5C. Effects Of Pollution

AN INVESTIGATION OF THE EFFECTS OF DDT AND OTHER CHLORINATED HYDROCARBONS ON THE GROWTH OF EURYHALINE MICROALGAE,
Maine Univ., Orono. Dept. of Botany; Maine Univ., Orono. Dept. of Oceanography; and Maine Univ., Orono. Dept. of Zoology.
R. L. Vadas.
Available from the National Technical Information Service as PB-229 680, $5.75 in paper copy, $1.45 in microfiche. Completion Report, June 1972. 48 p, 17 fig, 2 tab, 5 ref. OWRR A-021-ME(1).

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, Algae, *Dieldrin, Water pollution effects, Growth rates, Inhibition, Cytological studies.
Identifiers: *Euryhaline microalgae, *Porphyridium sp., *Platymonas subcordiformis, *Brachiomonas submarina.

This research project was initiated to determine the effects of chlorinated hydrocarbons at various concentrations on the growth of euryhaline microalgae, to determine if resistance to DDT occurs in algae with short generation times and with wide tolerances to naturally occurring environmental conditions, and to determine photosynthetic rates for algae treated with chlorinated hydrocarbons. Extensive studies on the effects of DDT on the growth of Platymonas subcordiformis indicate that some degree of resistance occurs naturally in the alga and that depressions in the carrying capacities and in growth rates, especially, in the form of lags, are common at sublethal levels. Growth rates were adversely affected by DDT concentrations at 100 to 200 ppb. At 500 ppb cells never recovered within the experimental period (7 to 10 days). Studies on the effects of DDT at varying salinity levels suggest that cells are less resistant to DDT at higher salinities (22 to 30 PPT). Other eurytolerant microalgae treated with an initial dose of DDT include Porphyridium sp. and Brachiomonas submarina. Both species were more presistant to DDT than P. subcordiformis. B. submarina was not affected by 500 ppb DDT. Porphyridium sp. was unaffected by DDT concentrations of 10,000 ppb. Both log cells of P. subcordiformis and Porphyridium sp. were tested with dieldrin in one-shot treatments. 100 ppb and 10,000 ppb did not inhibit these cells. Daily additions of DDT were tested on P. subcordiformis. DDT added at the beginning of either the light or dark cycle was inhibitory and reduced growth rates at 25 to 50 ppb. Experiments are currently in progress to determine the effect of the diurnal growth rhythm on the sensitivity of cells of P. subcordiformis to DDT.
W74-05407

INVESTIGATIONS OF FRESHWATER SURFACE MICROLAYERS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W74-05410

STAFF REPORT ON COAL GASIFICATION: PROCESSES AND EFFECTS,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5B.
W74-05416

WATER QUALITY CRITERIA, SECOND EDITION.
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 5A.
W74-05417

OCCURRENCE, RADIOACTIVITY, AND DIVERSITY, OF WINNIPEG RIVER BENTHIC ORGANISMS IN THE VICINITY OF WHITESHELL NUCLEAR RESEARCH ESTABLISHMENT,
Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment.
R. E. Ireland, J. E. Guthrie, and A. G. Robinson.
Available from NTIS, Springfield, Va., as Re AECL-4421, $5.45 per copy, $1.45 microfiche. I port No. AECL-4421, July 1973. 108 p, 10 fig, tab, 4 append.

Descriptors: *Nuclear powerplan *Radioactivity, Effluents, *Canada, Surve Assay, Benthos, Insects, Aquatic insects, Wa pollution, Biota, Aquatic life, Water quality.
Identifiers: *Winnipeg River.

The abundance and total beta activity of benthic insects in the Winnipeg River adjacent the Whiteshell Nuclear Research Establishm (WNRE) were determined during 1966 and 19 During the study, potential indicator species w identified and a number of aquatic insect speci not previously reported in Manitoba, were c lected. Tubificid worms, Chironomidae larv and Hexagenia spp. naiads were the most ab dant species in the total of 20 benthic taxa c lected. The radioactivity concentration ra (total beta activity of organism/total beta acti of water) of these species was about 2; therefc any of them could serve as indicators of chang the level of radioactivities in the aquatic biota stream and downstream of the WNRE liquid fluent outfall. Benthic-community diversity dices developed from information theory are fi ing increasing application as a method of assess water quality. The range of individual diversity dices (d) was 2.45 to 2.94, suggesting that the s tion of the river beside WNRE is mesotrophic. T information will serve as a baseline with which compare any future changes in the benthic c munities of the river. (Houser-ORNL)
W74-05418

ASSESSMENT OF POTENTIAL RADIOOLO CAL HEALTH EFFECTS FROM RANDON NATURAL GAS,
Office of Radiation Programs, Washington, D.C
R. H. Johnson, Jr., D. E. Bernhardt, N. S. Nelso and H. W. Calley, Jr.
Available from NTIS, Springfield, Va., as R No. EPA-520/1-73-004. $5.45 per copy, $ microfiche. Report No. EPA-520/1-73-004, N 1973. 71 p, 3 fig, 15 tab, 75 ref.

Descriptors: Radium radioisotopes, Radioactiv Radioactivity effects, Public health, Populati Water pollution, Water pollution sources, Nat gas, Bioassay, Biology, Toxicity, Cost-ben analysis.
Identifiers: *Randon.

Natural gas contains varying amounts of rad 222 which becomes dispersed in homes when n ral gas is used in unvented appliances. Ra decays to alpha-emitting daughter products wh can contribute to lung cancer when inhaled deposited in the respiratory system. For average use of unvented kitchen ranges and spa heaters, the tracheobronchial dose equivalen individuals was estimated as 15 and 54 mrem respectively, or 2.73 million person-rems/yr to United States population. A review of exposu conditions, lung model parameters, dose con sion factors, and health effect factors indica this population dose equivalent could potenti lead to 15 deaths a year from lung cancer. T represents only 0.03 to 0.08 percent of normal l cancer mortality. Since control of radon level gas would cost over $100 million for each rec tion of one health effect, it was concluded th requirement for such controls would not be c effective on a national basis. (Houser-ORNL)
W74-05420

DOSE AND RISK CONSIDERATIONS FOR T RELEASE OF I-131 AT SPECIAL SITES,
Kernforschungszentrum, Karlsruhe (West G many). Institut fuer Neutronenphysik und Re tortechnik.
A. Bayer.

ilable from IAEA, PO Box 433, New York, .. as Report STI/PUB-342; $29.00 per copy. ented at IAGA Symposium on Principles and dards of Reactor Safety, Held in Zurich, eral Republic of Germany, Feb 5-9, 1973. Re- STI/PUB-342, Feb 1973. 25 p, 8 fig, 3 tab, 29 (CONF-73-0217).

criptors: *Nuclear powerplants, Effluents, ine, Critical path method, *Radioactivity, En- nmental effects, Ingestion(Biological), Dis- ition patterns, Meteorology, Cost benefit anal- , Food chains, Population, Public health, dioisotopes.
tifiers: *Germany(Upper Rhine Valley).

e and risk considerations for the release of I- from nuclear installations are studied for the er Rhine Valley between Basel and Mainz, re an accumulation of nuclear power plants is cted and effects of superposition must be n into account. I-131 is taken as the critical pe. Incorporated iodine is deposited in the oid gland. The possible effect of this radiologi- burden is thyroid carcinoma. The age depen- inhalation dose factors and age dependent in- ion dose factors are shown, likewise the wn risk factors for thyroid carcinoma. In case ormal release of I-131 from nuclear installa- s, the resulting thyroid doses are calculated compared with the 90 mrem/a criterion. The age annual releases from accidental events, ved from an accidental release frequency rela- , are used to calculate the average doses from dental release and to compare them with the s from normal release. The resulting risks accidental releases are calculated and com- d with the natural risk of thyroid carcinoma.

-05421

AL ENVIRONMENTAL STATEMENT RE- ED TO OPERATION OF R. E. GINNA CLEAR POWER PLANT UNIT I, CHESTER GAS AND ELECTRIC CORPORA- N.
ctorate of Licensing (AEC), Washington,

ilable from NTIS, Springfield, Va., as Rept. Docket 50244-221. $7.60 per copy, $1.45 rofiche. Report No. Docket 50244-221, Dec . 298 p, 45 fig, 53 tab, 192 ref, 1 bib, 6 append.

criptors: *Lake Ontario, *Nuclear power- ts, Effluents, Environmental effects, Ad- istrative agencies, *Comprehensive planning, s, Geology, Investigations, Hydrology, mology, Climatology, Meteorology, Ecology, ioactive wastes, Water pollution, Water pollu- sources, Radioactive effects, Monitoring, lic health, Transportation, Beneficial use, t-benefit analysis, Fish, *New York.
itifiers: *Environmental impact statements, ssurized water reactors.

final environmental statement was prepared ompliance with the National Environmental cy Act and relates to the operation of the T. E. a Nuclear Power Plant Unit 1. The power t is located on Lake Ontario in Wayne County, York, and uses a pressurized-water reactor. exhaust steam will be condensed by once- ugh flow of water obtained from and harged to Lake Ontario. Environmental im- s are assessed and after consideration of alter- ves an environmental benefit-cost summary compiled. Environmental factors considered ude climate, hydrology (surface water and nd water), ecology including aquatic life, ing-water supply and discharge, cooling ers, cooling lakes, spray ponds, radioactive nical and sanitary wastes, amount of dissolved gen and toxic chemicals in effluent water. The clusion was to issue a full-term operation nse for the facility subject to the following nical specification requirements: (1) Define a prehensive environmental monitoring pro- gram. (2) Reduce or eliminate fish impingement on screens. (3) Monitor and control the use of chlorine. (4) Plan plant shutdowns to reduce cold-shock effect on fish. (5) Continue studies of any damage to Lake Ontario resulting from plant operations. (6) Provide analysis and course of action to alleviate any irreversible damages detected. (Houser-ORNL)
W74-05422

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED CATAWBA NUCLEAR STATION, UNITS 1 AND 2, DUKE POWER COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
Available from NTIS, Springfield, Va., as Rept. No. Docket 50414-56; $10.60 per copy, $1.45 microfiche. Rept. No. Docket 50413-56, Dec 1973. 385 p, 43 fig, 70 tab, 129 ref, 12 append.

Descriptors: *Nuclear powerplants, Effluents, Environmental effects, Administrative agencies, Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *South Carolina.
Identifiers: *Pressurized water reactors, *Lake Wylie(S.C.), *Environmental Impact Statements.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed issuance of construction permits for construction of the Catawba Nuclear Station, Units 1 and 2. The nuclear station is located on Lake Wylie, York County, South Carolina, and will employ two pressurized water reactors cooled by water through closed-cycle wet cooling towers with water from and discharged to Lake Wylie. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled.ironmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. AEC will issue construction permits subject to conformity with certain stipulations regarding construction activities, surveys, and monitoring to prevent significant adverse environmental impact. (Houser-ORNL)
W74-05423

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF SAN ONOFRE NUCLEAR GENERATING STATION UNIT 1, SOUTHERN CALIFORNAI EDISON COMPANY AND THE SAN DIEGO GAS AND ELECTRIC COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
Available from NTIS, Springfield, Va., as Rept. No. Docket 50206-237; $10.60 per copy, $1.45 per microfiche. Report No. Docket 50206-237, Oct 1973. 326 p, 28 fig, 41 tab, 180 ref, 7 append.

Descriptors: *Nuclear powerplants, Effluents, Environmental effects, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *California, Pacific Ocean.
Identifiers: *Environmental Impact Statements, *Pressurized water reactors, San Diego(Calif).

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the conversion of a provisional operating license into a full operating license for the San Onofre Nuclear Generation Station, Unit 1. The power station is located on the Pacific Coast in the State of California, County of San Diego. The unit employs a pressurized-wtor cooled by a once-through flow of water obtained from and discharged to the Pacific Ocean. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. It was concluded to convert the provisional license to a full-term operating license subject to the following limitation: (1) Define a comprehensive environmental monitoring program; (2) provide analysis and implement a program of remedial action to eliminate detrimental effects found. (Houser-ORNL)
W74-05424

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED LIMERICK GENERATING STATION, UNITS 1 AND 2, PHILADELPHIA ELECTRIC COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
Available from NTIS, Springfield, Va., as Rept. No. Docket 50352-62; $13.60 per copy, $1.45 microfiche. Report No. Docket 50352-62, Nov 1973. 686 p, 47 fig, 59 tab, 304 ref, 9 append.

Descriptors: *Nuclear powerplants, Effluents, Environmental effects, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Pennsylvania.
Identifiers: *Boiling water reactors, *Schuylkill River(Penn), *Perkiomen Creek(Penn), *Environmental Impact Statements.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed issuance of construction permits for the Limerick Generating Station, Units 1 and 2. The station is located on the Schuylkill River near Pottstown, Pennsylvania, and will employ two boiling water reactors cooled in two natural-draft cooling towers using water from Schuylkill River and Perkiomen Creek and discharged to the Schuylkill River. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. AEC will issue construction permits subject to certain stipulated requirements during construction. (Houser-ORNL)
W74-05425

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3, COMMONWEALTH EDISON COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
Available from NTIS, Springfield, Va., as Report No. Docket 50237-416 and 50349-313; $10.60 per copy, $1.45 microfiche. Report No. Docket 50237-416 and 50349-313, Nov 1973. 432 p, 49 fig, 51 tab, 211 ref, 7 append.

Descriptors: *Illinois, *Nuclear powerplants, Effluents, Environmental effects, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Sesimology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis.
Identifiers: *Boiling water reactors, Kankakee River(Ill), Deplaines River(Ill), *Environmental Impact Statements, *Illinois River(Ill).

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed issuance of a full-term operating license for the Dresden Nuclear Power Station, Unit 2, and continuance of operating license for Unit 3. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. It was concluded to issue a full-term operating license for Unit 2 and continue the operating license for Unit 3 subject to the following conditions: (1) complete modifications to radwaste systems, (2) complete technical specifications as required, (3) supply course of action to alleviate any harmful effects or evidence of irretrievable damage detected. (Houser-ORNL)
W74-05426

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE HADDAM NECK (CONNECTICUT YANKEE) NUCLEAR POWER PLANT, CONNECTICUT YANKEE ATOMIC POWER COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
Available from NTIS, Springfield, Va., as Report No. Docket 50213-228; $7.60 per copy, $1.45 microfiche. Report No. Docket 50213-228, Oct 1973. 324 p, 38 fig, 49 tab, 191 ref, 3 append.

Descriptors: *Connecticut, *Nuclear powerplants, Effluents, Environmental effects, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Connecticut River.
Identifiers: Pressurized water reactors, Haddam Neck(Conn), *Environmental Impact Statements.

The proposed action for the Haddam Neck Nuclear Power Plant is a conversion of the provisional operating license to a full-term operating license. The site is on the east shore of the Connecticut River, about 22 miles south-southeast of Hartford and about 16 miles north of Long Island Sound. The reactor is a pressurized water type cooled by water from and returned to the Connecticut River. This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the operation of the Haddam Neck Nuclear Power Plant. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to convert the provisional license to a full-term operating license subject to the following limitations: (1) continue studies to prevent fish entrainment on screens, (2) identify plant influences on algae, (3) determine Menhaden losses through the cooling system, (4) define and environmental monitoring program for assay of effects during operation. (Houser-ORNL)
W74-05427

FINAL ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION OF GRAND GULF NUCLEAR STATION UNITS 1 AND 2, MISSISSIPPI POWER AND LIGHT COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
Available from NTIS, Springfield, Va., as Report No. Docket No. 50416-42; $10.60 per copy, $1.45 microfiche. Report No. Docket 50416-42, Aug 1973. 478 p, 33 fig, 75 tab, 184 ref, 5 append.

Descriptors: *Mississippi River, *Nuclear powerplants, Effluents, *Environmental effects, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Mississippi.
Identifiers: *Boiling water reactors, *Environmental Impact Statements.

The Grand Gulf Nuclear Power Station is located in Claiborne County, Mississippi, on the east bank of the Mississippi River approximately 25 miles south of Vicksburg. The station will employ two boiling water reactors. The turbine steam condensers will be cooled by water circulated through wet, natural-draft cooling towers with makeup and blowdown water taken from and discharged to the Mississippi River. This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed construction of the Grand Gulf Nuclear Station Units 1 and 2. Environmental impacts are assessed and after consideration of alternatives and environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to issue a construction permit for the facility subject to the following conditions: (1) Implement monitoring programs for environmental effects; (2) control unnecessary impacts from construction; (3) study intake velocity of water; (4) provide information on entrainment and impingement of biota in the intake; (5) control the residual chlorine concentrations; (6 control gaseous radioactive effluents; and (7) control use of corrosion inhibitors. (Houser-ORNL)
W74-05428

A STOCHASTIC STUDY ON THE CONCENTRATION PROCESS OF RADIOACTIVE SUBSTANCES TO AQUATIC ORGANISMS,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5B.
W74-05429

RESPONSE OF RIVER WATER TO BIOCHEMICALLY DEGRADABLE SUBSTANCES IN PULP MILL WASTE WATER (ODEZVA REKY NA BIOCHEMICKY ODBOURATELNE LATKY V ODPADNICH VODACH Z CELULOZEK),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 5B.
W74-05431

EXPERIMENTAL STUDY OF THE EFFECT OIL ON SOME REPRESENTATIVES BENTHOS IN THE CASPIAN SEA,
Akademiya Nauk Azerbaidzhanskoi SSR, Insti Zoologii.
A. G. Kasymov, and A. D. Aliev.
Water, Air, and Soil Pollution, Vol 2, No 2, p 2 245, June 1973. 11 fig, 3 ref.

Descriptors: *Benthic fauna, Water pollution fects, *Toxicity, *Bioassay, Weight, Grow rates, Evolution, Worms, Mollusks, Oligochaet *Oil.
Identifiers: *Crude oil, *Caspian Sea, Macroinv tebrates.

Experimental studies of the influence of crude on bottom fauna in the Caspian Sea were c ducted in crystallizators and aquariums. Oil c centrations varing from 0.2 to 4.0 mg/l were us with water temperature of 19.3 to 24.4 C and dil O2 varying from 4.5 to 7.0 mg/l. Worm oligochaetes, and mollusks were used in the periments. Under high concentrations of (higher than 3 to 5 mg/l) the animals initially not change weight and then lost weight a perished. In a weak solution of oil (below 1 mg/l speed up in normal evolution, growth, a reproduction took place in the animals. (Mortla Battelle)
W74-05440

FLOCCULATION OF SUSPENDED SEDIME IN THE SEA,
Bedford Inst., Dartmouth (Nova Scotia). Atlan Oceanographic Lab.
For primary bibliographic entry see Field 5B.
W74-05441

THE PRODUCTION OF PARTICLES IN TH SURFACE WATERS OF THE OCEAN WI PARTICULAR REFERENCE TO THE SARG SO SEA,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 5B.
W74-05453

BACTERIAL DYNAMICS IN TWO HIGH-AR TIC LAKES,
McGill Univ., Montreal (Quebec). Dept. of Bio gy.
K. C. Morgan, and J. Kalff.
Freshwater Biol. Vol 2, No 3, p 217-228, 19 Illus.
Identifiers: *Arctic lakes, Bacterial dynamics, cles, *Eutrophication, Glucose, Lak *Phytoplankton, Absorption, *Heterotrophic b teria, Oligotrophic lakes, *Canada(Char La Meretta Lake).

The heterotrophic planktonic bacteria were s died by direct microscope count and the enzyma uptake of 14C labelled glucose which genera conformed to Michaelis-Menten kinetics. Bacte al numbers and activity in the oligotrophic Cl Lake, Canada, ranged from 0.1 to 2lx 10 to the power bacteria/l and a maximum uptake veloc (V max) of 1-8 x 10 to the -3rd power microgr glucose l to the -1 power h to the -1 pow Meretta Lake received waste water from the D partment of Transport Base at Resolute and t eutrophication was reflected in higher bacte numbers of 2-80 x 10 to the 8th power/l and Vm of 0.1 x 10 to the -1 power-7.5 x 10 to the -1 pow microgram glucose l to the -1 power h to the power. The Vmax per cell in Char Lake was 3 x to the -11 power microgram glucose l to the power h to the -1 power and changed little betwe the period of solid ice cover in May and ice-f conditions in Aug. Bacterial cycles could not be lated to phytoplankton cycles in either lake. Co parison of kinetic data from several lakes s gested a relationship between the bacterial upta rate of glucose and phytoplankton producti Both bacterial numbers and activity in Char La

ıay be very close to the minima to be expected in ndisturbed freshwater environments.--Copyright 973, Biological Abstracts, Inc.
/74-05458

HE PERSISTENCE AND MOVEMENT OF ICLORAM AND 2,4,5-T IN SOILS,
lorth Carolina State Univ., Raleigh. Pesticide esidue Research Lab.
or primary bibliographic entry see Field 5B.
/74-05459

FFECTS OF PH AND TEMPERATURE ON HE FATTY ACID COMPOSITION OF BACIL-US ACIDOCALDARIUS,
onsiglio Nazionale delle Ricarche, Naples (Italy). aboratorio di Chimica e Fisica di Molecole di In-:resse Biologico.
I. De Rosa, A. Gambacorta, and J. D. Bu'Lock.
ournal of Bacteriology, Vol. 117, No. 1, p 212-14, January 1974. 1 tab, 8 ref.

)escriptors: *Hydrogen ion concentration, Cytological studies, *Temperature, Lipids, *Gas hromatography, Cultures, Aeration, Growth ıtes, Metabolism, Aerobic bacteria.
dentifiers: *Fatty acids, *Bacillus acidocaldarius, 'hemical composition, Methyl esters, 11-'yclohexylundecanoic acid, 13-Cyclohexyl-idecanoic acid, Anteiso-heptadecanoic acid, Iso-eptadecanoic acid, Thin layer chromatography, ample preparation.

'he fatty acid composition of lipid extracts from ells of Bacillus acidocaldarius grown at tempera-ıres of 50 to 70C and pH values of 2 to 5 was etermined by gas chromatography of the methyl sters. The most abundant fatty acids are 11-yclohexylundecanoic and 13-cyclohexyl-idecanoic, followed by anteiso- and iso-hep-adecanoic; unsaturated acids are absent. Highly erated cultures produce more of the iso and an-:iso acids and less of the cyclohexyl acids. The ffects of temperature and pH are interdependent; t lower pH, increasing temperature raises the pro-ortion of the iso and anteiso acids, but at higher H the effect of increasing temperature is :versed and the proportion of the cyclohexyl cids is increased. (Mortland-Battelle)
/74-05461

.CETYLCHOLINESTERASE TOXICITY OF 1ALATHION AND ITS METABOLITES,
ulf Coast Research Lab., Ocean Springs, Miss.
V. W. Walker, and B. J. Stojanovic.
ournal of Environmental Quality, Vol. 2, No. 4, p 74-475, October-December 1973. 1 tab, 7 ref.

)escriptors: *Pesticide toxicity, *Microbial egradation, Inhibition, Enzymes.
dentifiers: *Metabolites, *Malathion, Acetylcholinesterase, Malathion half ester, lalathion dicarboxylic acid, Potassium dimethyl hosphorothioate, Potassium dimethyl hosphorodithioate, *Arthrobacter, Warburg ap-aratus, Manometers, Detoxification, In vitro :sts.

lalathion, under the vitro laboratory conditions, readily degraded by an Arthrobacter species to our metabolites - malathion half-ester, malathion icarboxylic acid, potassium dimethyl hosphorothioate, and potassium dimethyl hosphorodithioate. However, it is not clear hether or not this degradation represents a simul-ıneous detoxication of the malathion molecule. /ith this in mind, the relative toxicity of each of ıe four metabolites to bovine cetylcholinesterase was determined manometri-ally with the Warburg apparatus. Malathion half-ster retained roughly one-third the enzyme toxici-/ of unaltered malathion, while the other ıetabolites showed essentially no enzyme inhibi-on. It was concluded that while microbial conver-on of malathion to malathion half-ester may well represent complete malathion degradation, it does not constitute complete insecticide detoxication. (Little-Battelle)
W74-05466

ALGAE IN THE SPOON RIVER, ILLINOIS 1971-1972,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 5B.
W74-05483

THE EFFECTS OF SELECTED HERBICIDES ON BACTERIAL POPULATIONS IN AN AQUATIC ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Microbiology and Medical Technology.
R. N. Ferebee, and R. K. Guthrie.
Water Resources Bulletin, Vol 9, No 6, p 1125-1135, December 1973. 4 fig, 4 tab, 12 ref.

Descriptors: *Paraquat, *2, 4, 5-T, Aquatic bacteria, Population, *Bioassay, Water pollution effects, *Herbicides, Pesticide residues, Degradation(Decomposition), Sulfur compounds, Chlorinated hydrocarbon pesticides, Aquatic environment, Water temperature, Hydrogen ion concentration, Dissolved oxygen, Cultures, Laboratory tests, Water analysis, Plant growth, Aquatic algae, Chemical analysis, Isolation, Pseudomonas, Streptococcus, Salmonella.
Identifiers: *Diuron, *Heterotrophic bacteria, *Bacterial physiology, Bacterial growth, Mesophilic bacteria, Culture media, Oxygen consumption, Bacillus, Achromobacter, Micrococcus, Staphylococcus, Flavobacterium, Sarcina, Escherichia, Alcaligenes, Aerobacter, Brevibacterium, Chromobacterium, Serratia, Streptomyces, Proteus.

Heterotrophic, mesophilic bacteria derived from, and maintained in, a freshwater environment where subjected to three classes of her, 2,4,5-trichlorophenoxyacetic acid, and paraquat, used as water soluble solutions, were added (0.7 and 1.4 mg/1) to a laboratory culture of bacteria. Total numbers of the bacteria, representing several genera, were monitored for alteration of numbers and types. Temperature, pH, and dissolved oxygen were monitored and the culture medium was tested for residual herbicide. Trichlorophenoxyacetic acid, 2,4, 4-T, did not affect that portion of the bacterial population tested. Increase of bacterial counts as the result of paraquat addition was real, with both direct and indirect effects. Diuron caused a reduction in the total bacterial counts and selective enrichment. The reasons for the observed differences are discussed. The herbicides remained qualitatively measurable for periods up to 3 weeks. (Holoman-Battelle)
W74-05484

NITROGEN TRANSFORMATIONS IN SEDIMENTS AS AFFECTED BY CHEMICAL AMENDMENTS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-05485

EFFECTS OF SEDIMENTATION OF THE ALGAL FLORA OF A SMALL RECREATIONAL IMPOUNDMENT,
Virginia Commonwealth Univ., Richmond. Dept. of Biology.
G. L. Smsel, Jr.
Water Resources Bulletin, Vol 9, No 6, p 1145-1152, December 1973. 1 fig, 3 tab, 8 ref.

Descriptors: *Sedimentation, Environmental effects, *Nutrients, *Aquatic algae, *Standing crops, Primary productivity, Winter, Chemical properties, Physical properties, Phytoplankton, Chlorophyta, Chrysophyta, Chrysophyta, Cyanophyta, Chlorophyll, Silicates, Phosphates, *Virginia, Impoundments, Water sampling, Secchi disks, Photosynthesis, Oxygen, Hydrogen ion concentration, Carbon dioxide, Nitrates, Nitrites, Sulfates, Hardness(Water), Chlorides.
Identifiers: *Photosynthetic rates, Chemical concentration, Ammonium, Orthophosphates, Closterium, Trachelomonas, Desmids, Ulothrix, Mougeotia, Spirogyra, Oedogonium, Rhizoclonium, Stigeoclonium, Zygnema, Desmidium, Volvox, Ooxystis, Chlorococcus, Netrium, Staurastrum, Bulbochaete, Dinobryon, Navicula, Nitzschia, Synedra, Tabellaria, Vaucheria, Lyngbya.

Investigations were initiated to evaluates of sedimentation on the algal composition, primary productivity rates and chemical nutrient concentrations of a 17-acre recreational impoundment in central Virginia. Comparisons during the winter seasons of 1972-1973 indicated that as a result of sedimentation, from lake front home construction, the total numbers of algal genera in the lake decreased from 24 to 16, productivity as measured by C-1402 and total extractable chlorophyll decreased two-fold, and several important nutrients, i.e. NH4-N, Si02 and P04-P increased significantly. (Holoman-Battelle)
W74-05486

TREND SULFACE ANALYSIS AND SEASONAL DISTRIBUTION PATTERNS OF PRIMARY NUTRIENTS AND CHLOROPHYLL IN UNSTRATIFIED GULF COAST ESTUARIES,
Texas Univ., Houston. School of Public Health.
For primary bibliographic entry see Field 5B.
W74-05488

SPECIES INTRODUCTION IN A TROPICAL LAKE,
Washington Univ., Seattle. Dept. of Zoology.
T. M. Zaret, and R. T. Paine.
Science, Vol 182, No 4111, p 449-455, November 2, 1973. 5 fig, 2 tab, 26 ref.

Descriptors: *Lakes, *Predation, *Trophic level, *Food webs, *Food chains, *Tropical regions, Freshwater fish, Aquatic environment, Aquatic populations, Biological communities, Cichlids, Zooplankton, Phytoplankton, Chlorophyta, Mosquitoes, Human diseases, Bacteria, Aquatic insects.
Identifiers: *Piscivores, Cichla ocellaris, *Panama Canal Zone(Gatun Lake), Malaria, Black terns, Kingfishers, Herons.

Probably in early 1967, a piscivore from South America, Cichla ocellaris, was introduced to Gatun Lake in the Panama Canal Zone. As this predator population spread through the lake, the initial effect was dramatic reductions in almost secondary consumers. These species reductions produced, in turn, second- and third-order changes at other trophic levels of the ecosystem. The resulting changes in the lake community can be seen best by examining the general Gatun Lake food wed. The decrease in numbers of the important planktivore Melaniris has resuld in changes within the zooplankton community, as illustrated by the cladoceran Ceriodaphnia. The tertiary-consumer populations, such as tarpon, black terns, kingfishers, and herons, formerly dependent on small fishes for food, appear less frequently in the Cichla areas of the lake. There has also been, possibly, a resurgence of the local mosquito populations (which are malaria vectors), caused by the reduction in the populations of insect-eating fishes. Even the primary producers may be affected by this introduction. Although at present the Gatun Lake ecosystem is undergoing rapid changes, we anticipate an eventual return to some form of equilibrium. However, it will be some time before one can evaluate the permanence or transience of the many changes produced in the trophic levels by the introduction of a single, toplevel predator to this lake system. (Mortland-Battelle)
W74-05492

THE KINETICS OF YEAST GROWTH ON PURE HYDROCARBONS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Microbiological Inst.
For primary bibliographic entry see Field 5B.
W74-05493

EXPERIMENTAL APPROACHES TO LIMNOLOGY - AN OVERVIEW,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W74-05498

EFFECT OF TEMPERATURE VARIATIONS ON GROWTH, REPRODUCTION, AMINO ACID SYNTHESIS, FAT AND SUGAR CONTENT IN ULVA FASCIATA DELILE PLANTS,
Alexandria Univ. (Egypt).
A. F. Mohsen, A. H. Nasr, and A. M. Metwalli.
Hydrobiologia, Vol 42, p 451-460, September 28, 1973. 5 fig, 11 ref.

Descriptors: *Water temperature, *Thermal stress, *Marine algae, *Plant physiology, Growth rates, Reproduction, Amino acids, Lipids, Marine plants, Sea water, Waves(Water), Currents(Water), Metabolism, Cultures, Germination, Nitrogen, Chlorophyta, Plant growth, Lethal limit
Identifiers: *Ulva fasciata, Biosynthesis, Mediterranean Sea, Sporophytes, Gametophytes, Plant metabolism.

This work deals with the effect of temperature variations on growth, reproduction, amino acid synthesis, fat and sugar content in Ulva fasciata inhabiting the littoral region of the Mediterranean shore bordering Alexandria. Higher temperatures above 30C have lethal effects on some parts of the algal fronds while the other are rather resistant. The latter are scattered groups of cells, which usually regenerate new plants when carried even to distant parts due to detrimental action of waves and currents. They serve a good means for vegetative propagation and spread better than zooids, which probably perish under such severe and violent conditions. The rate of growth of Ulva indicated by the increase in dry weight and total nitrogen, increases at rising temperature till the latter becomes limiting. Higher temperatures favour the growth and development of sporophytic phases, known by their deep green colouration, while temperatures below 20C favour the production of gametophytes, identified by their yellowish green colour. This might explain why most of the algal crops of Ulva fasciata produced from parental stock (3 crops per year i.e. annually), are sporophytes. Moderate temperatures were favourable for growth, reproduction and the various metabolic processes. Amino acids and sugar contents increase with the rise of temperature, reaching their maximum around 25C, while fat content increases at still lower temperatures. (Mortland-Battelle)
W74-05499

TRANSPORT, FATE AND GEOCHEMICAL INTERACTIONS OF MERCURY, CADMIUM AND OTHER INORGANIC POLLUTANTS IN THE COASTAL LITTORAL-SALT MARSH ENVIRONMENT OF THE SOUTHEASTERN UNITED STATES,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5B.
W74-05501

OCCURRENCE OF THE PARASITIC BRANCHIURAN, ARGULUS ALOSAE, ON DYING ATLANTIC MENHADEN, BREVOORTIA TYRANNUS, IN THE CONNECTICUT RIVER,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Coastal Fisheries Center.
R. L. Kroger, and J. F. Guthrie.
Trans Am Fish Soc. Vol 101, No 3, p 559-560, 1972.
Identifiers: Argulus-alosae, *Atlantic menhaden infection, *Branchiuran parasite, Brevoortia-tyrannus, *Connecticut River, Dace, Economics, Exhaustion, Rivers, Roach, *Fish parasites, Fish mortality, *Fish diseases.

Dying adult Atlantic menhaden B. tyrannus infested with parasitic branchiuran A. alosae were collected from the Connecticut River at Old Saybrook, Connecticut. Examination of 50 dying menhaden (average 300 mm fork length) showed that each was heavily infested with argulid fish lice. A. alosae is probably of economic importance since heavy infestations of other fish lice species have destroyed entire fish populations in confined environments such as pools and lakes. The abnormal behavior of adult menhaden may have resulted from irritation caused by A. alosae. Menhaden, like roach and dace, may be hypersensitive to attacks by fish lice, and physical exhaustion resulting from parasite irritation caused the mortality of menhaden in the river.--Copyright 1973, Biological Abstracts, Inc.
W74-05526

A STUDY OF WATER-SOLUBLE INHIBITORY COMPOUNDS (ALGICIDES) PRODUCED BY FRESH-WATER ALGAE,
Kentucky Water Resources Inst., Lexington.
D. O. Harris, and M. C. Parek.
Available from the National Technical Information Service as PB-229 831; $4.75 in paper copy, $1.45 in microfiche. Research Report No. 69, November 1973. 34 p, 10 tab, 13 ref. OWRR A-018-KY(6). 14-01-0001-1085, 14-01-0001-1636, 14-31-0001-3017, and 14-31-0001-3217.

Descriptors: Algal toxins, Aquatic algae, Algal poisoning, *Aquatic weed control, *Chlorophyta, Nuisance algae, Algal control, Scum, Water pollution effects, *Algicides, *Inhibitors, *Plant growth regulators.
Identifiers: *Pandorina morum, *Volvox tertius, Staphylococcus aureus.

A complex system of growth inhibitors was observed in the green algae (Volvocaceae). Inhibitors were found in the culture filtrates of some genera which limit their own growth (auto-inhibitors) while others in the family produce substances which check the growth of other genera (heteroinhibitors). These inhibitors were destroyed by autoclaving. It was decided that Pandorina morum, which produced the strongest inhibitor and Volvox tertius, the most sensitive to the inhibitor would make an excellent model system for a study of the chemical and physical properties of these naturally occurring algicides. The algicide could be removed from actively growing cultures about the 12th day after inoculation and maximum inhibition was recorded for the next 18 days. The substance could be diluted several times with the retention of at least partial activity. The inhibitor was relatively stable to high temperatures, moved slowly through a dialysis membrane and possessed anti-bacterial properties in that it inhibited the growth of Staphylococcus aureus. The material was relatively stable when exposed to acid, although exposure to a pH of 2.0 for 30 minutes did destroy most of the activity. The substance was soluble in benzene and chloroform. All attempts to degrade or destroy the inhibitor with the common proteolytic enzymes (trypsin, chymotrypsin and pronase) proved unsuccessful, suggesting the substace is not proteinaceous in nature. In experiments with G-25 and G-50 Sephadex, the inhibitor was retained on the column, indicating a molecular weight of less than 5000. (Grieves-Kentucky)
W74-05537

ENZYME AND TISSUE ALTERATIONS IN FISHES: A MEASURE OF WATER QUALITY,
Louisville Univ., Ky. Dept of Anatomy; and Louisville Univ., Ky. Water Resources Lab.
D. E. Hinton, M. W. Kendall, and J. C. Koenig.
Available from the National Technical Inform
Service as PB-229 743; $4.50 in paper cop
$1.45 in microfiche. University of Kentucky Wa
Resources Research Institute, Lexingtc
Research Report No. 68, August 1973. 90 p, 64 f
3 tab. OWRR A-038-KY(3). 14-31-0001-3517.

Descriptors: *Bioindicators, Biochemistry, E
vironmental effects, *Enzymes, Fish physiolo
*Toxicity, Water quality, *Copper, Fish patho
gy, Freshwater fish, *Channel catfish, Water p
lution effects, Electron microscopy.
Identifiers: *Fish tissues, Fish organs, Enzy
histochemical methods, Pathobiological autop
Mercury compounds, *Methyl mercuric chloride

A variety of freshwater fishes were studied
light and electron microscopy, enzy
histochemical and biochemical methods. The
jective was to determine normal structure a
function in specific target organs and to comp
these to altered states in aquatic pollution. T
basic question, 'can fish tissues and enzym
serve as indicators of water quality,' was ask
Microscopic alteration in gill was indicative
copper toxicity at an exposure of 20 parts per
lion. Gross and light microscopic alterations w
indicative of a single exposure of channel catf
to 15 parts per million of methyl mercuric chlor
(CH3HgCl). Microscopic and correlated biochem
cal study fingerprinted the alterations in cells at
exposure of 0.67 parts per million CH3HgCl. T
developments of pathobiological autop
techniques for the assessment of water quality
discussed. (Grieves-Kentucky)
W74-05540

EFFECTS OF DREDGE AND FILL ACTIVITI
IN THE COCOHATCHEE RIVER,
E. T. LaRoe.
The Florida Naturalist, Vol 45, No 6, p 166-1
1972. 5 photo.

Descriptors: Rivers, *Estuaries, *Water quali
*Mangrove swamps, *Silting, *Channeli
*Florida, Fish, Food chains, Salinity, Drainag
Ecosystem, Plankton, Algae, Water resourc
Flow, Dredging, Brackish water.
Identifiers: Hydro period, *Cocohatch
River(Fla).

The Cocohatchee River in southern Florida is
extremely productive river which has be
threatened by dredge and fill activities. The rive
productivity is due to a delicate and comp
balance of several factors, including the quant
and quality of the water, the hydro period, and t
mangroves which line its banks. Historically, t
Cocohatchee was a meandering creek, which p
mitted water from the interior to slowly flow do
the river. During dry spells, fresh water continu
to enter the river from the upland slough. T
system was one of gradual change, encouragin
steady state of high productivity. Channelizati
in the last decade has had varied effects upon t
river's ecosystem. First, it has reduced the hyc
period, or the period of fresh water flow from t
interior. This has changed the steady system
brackish water to one of sudden, extreme chan
of fresh and salt water, reducing the rive
productivity since many of the organisms can
tolerate such extreme changes. Channelizati
also caused the removal of many mangrov
which provide the base for the river's food cha
and destroyed the roots of the mangroves wh
had previously reduced siltation. (Ritchie-Florid
W74-05571

AQUATIC ANOMALIES: SYMPTOMS OF
SICK OCEAN,
Florida Conservation Foundation, Winter Pa
Environmental Information Center
For primary bibliographic entry see Field 5B.
W74-05572

SMALL OIL SPILL,
oods Hole Oceanographic Institution, Mass.
ır primary bibliographic entry see Field 5B.
74-05578

ESCUING THE OCEANS, THE NEED FOR IMEDIATE ACTION,
Y. Cousteau.
ırrent, p 36-39, December 1971.

scriptors: *Oceans, *Water pollution sources, Vater pollution effects, *Ocean water, ommercial fishing, Wildlife conservation, efs, Aquatic animals, Competition, Economics, ices, Indirect costs, Economic efficiency, ıemical wastes, Pesticide residues, Public alth, Social costs, Aesthetics, Environment, Enonmental effects, Coral, Atolls.

e impending destruction of the ocean by pollun and other causes is discussed. Disappearance coral reefs is due in part to pollution, fishing, d manual destruction. Teams of Tahitian divers stroy ten kilometers of reef a week for shells at are sent to museums and shops around the rld. In the past people though the oceans so imnse that no harm could be done to it. Air, land, d water pollution are usually discussed as parate entities, but all will end up in the ocean. ready, twenty-five percent of all DDT comunds so far produced are in the ocean. Another ason for the deterioration of the ocean is overhing. Improved catches in recent years have en due to improved fishing methods, but this ar the catch declined. A 1960 study indicated it in eighty years more than eight hundred spes had been exterminated by man. Overpopulan and unrestricted competition are the main sons for the planet's destruction. Remedies ggested are: (1) intensification of research and ucation of the public; (2) adding the cost of aning the environment to product cost; and (3) ernational cooperation. (Sperling-Florida)
74-05579

SH FAUNA IN RIVER NAGARAGAWA AND S CHANGE FOR THE LAST SEVERAL ARS IN RELATION TO RIVER POLLUTION JAPANESE),
ki High School (Japan).
Goto, and T. Goto.
J Ecol, Vol 21, No 5/6, p 254-270, 1972, Illus, glish summary.
ntifiers: Actinopterygian, *Japan(Nagaragawa ver), Lamprey, Pollution, Rivers, Years, Weirs, ish fauna, Goby, Loach, Chubs, Gudgeon, Bullid, Dace, *Water pollution effects, *Fish populons, *Pulp wastes.

h fauna were investigated quantitatively in the ddle reaches of the Nagaragawa River, Gifu fecture, Japan, from May 1967-Aug. 1971, by ng a small weir-trap 'Noboriochi.' As the result p. of lamprey and 35 spp. of actinopterygian es were recorded. The number of fishes colted changed remarkably from year to year. ong the 10 spp. of dominant fishes, the number a goby (Rhinogobius flumineus), a loach waella delicata), chubs (Zacco platypus, Z. mincki), a gudgeon (Pseudogobio esocinus) l a bullhead (Liobagrus reini) decreased, while a tain loach (Cobitis biwae) rather increased, but udgeon (Gnathopogon elongatus) and a dace ibolodon hakonensis) did not change in quantiluring the years. The fish fauna and their popuons were much different and remarkably lower npared with that of 10 yr before. The change y be caused not only by the change of environntal conditions in the river estuary affecting dromous and amphidromous fishes but also by effect of the pollution by the effluents of the p and paper mills.--Copyright 1973, Biological stracts, Inc.
4-05580

STRIP MINING: PARTNERSHIP IN GREED,
H. M. Caudill.
American Forests, Vol 79, p 16-19, May 1973. 1 tab, 1 photo.

Descriptors: *Strip mines, *Coal mines, *Strip mine wastes, *Land reclamation, *Industrial production, Economic impact, Strip mine lakes, Coal mine wastes, Water pollution sources, Social aspects, Percolation, Topsoil, Soil leaching, Acidic water, Industrial wastes, Mine acids, Aesthetics.

The effect of strip mining on the landscape is described. Companies that shred a hill or plain do so to satisfy insistence on cheap power and abundant industrial products. Water collects in the empty holes and sulfur, iron, and other minerals leach out of the cliff polluting the water. On two adjacent valleys in Kentucky scientific studies indicated that in the mined valley thirty-thousand tons of dirt per square mile washed out compared to twenty-seven tons in the valley still under its natural woodland cover. Flood control reservoirs for which the Army Corps of Engineers expended eighty-three million dollars, were choked with mine silt. Stripping had reduced their life expectancy to ten or fifteen years. One reservoir became sterile within three years after stripping first yellowed its water. There is a need for stern laws and a land ethic which places the preservation of the earth and its waters above comfort, prestige, affluence, and liberty of the people. (Sperling-Florida)
W74-05582

DISEASES OF THE CULTIVATED PORPHYRA AT CULTURE BEDS WITH SPECIAL REFERENCE TO THE EFFECTS OF FERTILIZER PLANT EFFLUENTS (IN KOREAN),
Pusan Fisheries Coll. (Republic of Korea).
J. W. Kang.
Bull Kor Fish Soc, Vol 5, No 2, p 39-44, 1972, Illus, English summary.
Identifiers: Bays, Culture beds, Effluents, *Fertilizers, *Korea(Chinhae Bay), Photosynthesis, Pollution, *Porphyra diseases, Tides, Water pollution effects.

The Chinhae Bay (Korea) and adjacent waters were contaminated with fertilizer plant effluents. The photosynthetic activity of P. suborbiculata is lower by 4% in 200 ppm, 20% in 300 ppm and 43% in 1000 ppm of contaminated seawater containing diluted pollutants from the fertilizer plant. Photosynthesis was depressed about 21-34% near the fertilizer plant, and in the area of the Porphyra beds, 15% in the portion where tide is weak and 5% where the tide is strong, in comparison with the area of unpolluted water.--Copyright 1973, Biological Abstracts, Inc.
W74-05618

ENERGY PRODUCTION AND ENVIRONMENTAL CONSEQUENCES,
Office of Science and Technology, Washington, D.C.
R. Balzhiser.
In: Proceedings of Fourth National Sea Grant Conference, October 12-13, 1971, Madison, Wisconsin, 1225 West Dayton Street, Sea Grant Program, University of Wisconsin, Madison, p 61-71. 1 fig.

Descriptors: *Energy, *Environmental effects, *Power plants, Sites, Coals, Energy conversion, Legislation, Nuclear Reactors, Oil, Thermal pollution, Water resources, Technology, Nuclear power plants, Natural gas.
Identifiers: *Energy sources, Offshore plant sites, Skelly Wright/Calvert Cliffs decision.

The five major sources of energy in the United States, petroleum, natural gas, coal, hydro, and nuclear, are illustrated graphically. The only resource supplies which are available in sufficient abundance to meet future energy needs are coal and fissionable material, and given new technology, the sun and the sea. Legislation, pending before Congress regarding power plant siting, would require utilities to establish a ten year regional plan with information made available to state certifying agencies and the public ten years in advance of power plant construction. In July 1969, the Skelly Wright/Calvert Cliffs decision was made, requiring that each nuclear plant construction have an environmental impact statement which would consider thermal pollution and other environmental degradations, as well as operating hazards. This decision resulted in the writing of nearly one hundred environmental impact statements and could add two years to the time needed to get nuclear power plants into operation. New technological developments in energy production include: the liquid metal fast-breeder reactor, the offshore siting of large nuclear power stations, the improved efficiency of converting thermal to electrical energy, and the more efficient use of energy. (See also W74-05644) (Pinsky-Wisconsin)
W74-05645

SOME ECOLOGICAL EFFECTS OF DISCHARGED SUGAR MILL WASTES ON MARINE LIFE ALONG THE HAMAKUA COAST, HAWAII,
Hawaii Univ., Honolulu. Inst. of Marine Biology.
R. W. Grigg.
In: Hawaii Univ., Honolulu, Water Resources Research Center, Water Resources Seminar Series No. 2, December 1972, p 27-45. 7 fig, 7 tab, 9 ref.

Descriptors: *Marine biology, *Deposition(Sediments), *Food processing industry, *Hawaii, Pacific Ocean, Benthos, Coral, Marine fish, Reefs, Sugar cane, Sedimentation, Turbidity, Bioindicators, Industrial wastes.
Identifiers: *Hamakua coast(Hawaii), Sugar mill wastes, Bagasse.

A study was designed to evaluate the impact of sugarcane mill wastes on the marine environment off Hawaii's Hamakua coast since inorganic suspended solids settle out from the effluents accumulating on the bottom. Corals are very intolerant to sedimentation and may serve as sensitive indicators of particulate matter. Reef fishes also may be excellent indicators. No significant changes in temperature, salinity, or oxygen concentration were detected in the receiving waters off the sugar mills. Significant sediment deposits and bagasses exist in the immediate vicinity off the sugar mills at Pepeekeo, Hakalau, Ookala, and Honokaa. Intertidal organisms, coral, and other benthic invertebrates have been covered where sediments have accumulated. Recovery of coral and associated organisms in shallow water appears to begin soon after the mills cease discharging effluents. The pattern of distribution and abundance of Pocillopora meandrina, which is particularly sensitive to sedimentation, may be a good indicator of pollution by sugar mill wastes. Changes in both species and abundance of nearshore fishes have been observed off sugar mills where the catches were about one-third those off control stations. Fishermen agree that the major changes occurred shortly after mechanical harvesting of sugar cane began superseding the previous method of hand-harvesting. (See also W73-05857) (Jones-Wisconsin)
W74-05660

ORIGINS OF SUGAR MILL DISCHARGES ON THE HILO-HAMAKUA COAST AND A COURSE OF ACTION FOR THEIR CONTROL,
Brewer (C.) and Co. Ltd., Hawaii.
Q. D. Stephen-Hassard.
In: Hawaii Univ., Honolulu, Water Resources Research Center, Water Resources Seminar Series No. 2, December 1972, p 49-52. 6 fig.

Descriptors: *Sugarcane, *Effluents, *Hawaii, *Food processing industry, *Pollution abatement,

Coasts, Pacific Ocean, Soils, Harvesting, Fibers(Plant), Technology.
Identifiers: *Hilo-Hamakua coast(Hawaii), *Sugar mill wastes, Bagasse.

A largely aesthetic problem was created by sugar mill discharges along the Hilo-Hamakua coast off Hawaii due to the general practice of mechanical harvesting. Discoloration of the Pacific is caused by wash water effluents containing soil and fibrous waste products of cane cleaning and processing which the prevailing wet conditions and economic factors have precluded recycling for irrigation. While some mills will be closed others will handle the greater volume with firm pollution abatement plans to be implemented. One mill modification will include installation of a new boiler generator complex to consume all excess fibrous waste for generation and sale of electricity. Wastewater usage will be reduced by about 80% by dry cleaning cane with air blasts and using recycled mixed cane juice for final cleaning prior to milling. Improved harvesting techniques to reduce soil contact with cane are being developed. Although pollution abatement implementation is proceeding at best possible speed, the industry is considered in violation of the 1899 Refuse Act and court action is imminent. Ecological significance of the discharges is being evaluated against the costs of the injunction which could close all mill operations until clean-up is fully completed. (See also W73-05857) (Jones-Wisconsin)
W74-05661

THE INTERDEPENDANCE OF MARINE AND ESTUARINE ECOSYSTEMS IN SOUTH AFRICA,
Natal Univ., Durban (South Africa). Oceanographic Research Inst.
For primary bibliographic entry see Field 5B.
W74-05713

RESILIENCE AND STABILITY OF ECOLOGICAL SYSTEMS,
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
C. S. Holling.
Research Report (1972). 50 p, 4 fig, 45 ref.

Descriptors: *Ecology, *Ecosystems, *Balance of nature, Environmental effects, *Fish management, Productivity, Ecological distribution, Reviews, *Behavior.

This review explores both ecological theory and the behavior of natural systems to see if different perspectives of their behavior can yield different insights that are useful for both theory and practice. The resilience and stability viewpoints of the behavior of ecological systems can yield very different approaches to the management of resources. The stability view emphasizes the equilibrium, the maintenance of a predictable world, and the harvesting of nature's excess production with as little fluctuation as possible. The resilience view emphasizes domains of attraction and the need for persistence. But extinction is not purely a random event: it results from the interaction of random events with those deterministic forces that define the shape, size and characteristics of the domain of attraction. The very approach, therefore, that assures a stable maximum sustained yield of a renewable resource, might so change these conditions that the resilience is lost or is reduced so that a chance and rare event that previously could be absorbed can trigger a sudden dramatic change and loss of structural integrity of the system. A management approach based on resilience, on the other hand, would emphasize the need to keep options open, the need to view events in a regional rather than a local context, and the need to emphasize heterogeneity. The resilience framework does not require a precise capacity to predict the future but only a qualitative capacity to devise systems that can absorb and accommodate future events in whatever unexpected form they may take. (Knapp-USGS)
W74-05727

BIOLOGICAL ACTIVITY OF A CELL EXTRACT FROM THE DINOFLAGELLATE, AMPHIDINIUM CARTERI,
National Marine Fisheries Service, Milford, Conn. Milford Lab.
F. P. Thurberg, and J. J. Sasner, Jr.
Chespeake Sci. Vol 14, No 1, p 48-51. 1973. Illus.
Identifiers: Amphibian hearts, *Amphidinium-Carteri, Atropine, Biological studies, *Cardio vascular drugs, Cell, *Crustaceans, *Dino-flagellate, Extracts, Fish, *Molluscans, Mytolon, Toxins.

Some physiological and pharmacological effects of cell extracts from A. carteri cultures are described. Mice and fish were killed by injection of extracts from lyophilized cells concentrated by centrifugation. Cellular extracts of A. carteri increased the development of tension in crustacean hearts while inhibiting molluscan and amphibian heart activity. The inhibitory effect was blocked by pretreatment of molluscan hearts with mytolon and amphibian hearts with atropine. Such physiological tests and recent chemical information indicate that a choline-like substance(s) is produced by A. carteri.--Copyright 1973, Biological Abstracts, Inc.
W74-05744

FISHES, MACROINVERTEBRATES, AND HYDROLOGICAL CONDITIONS OF UPLANDS CANALS IN TAMPA BAY, FLORIDA,
National Marine Fisheries Service, St. Petersburg Beach, Fla. Gulf Coast Fisheries Center.
W. N. Lindall, Jr., J. R. Hall, and C. H. Saloman.
U.S. Natl Mar Fish Serv Fish Bull. Vol 71, No 1, p 155-163. 1973, Illus.
Identifiers: Bays, *Canals(Upland), Estuary, *Fish, *Florida(Tampa Bay), Hydrological studies, *Invertebrates, *Dissolved oxygen, Water pollution effects.

Faced with statutory restraints that prohibit dredging and filling of estuarine bottoms, coastal developers have turned to alternate methods of providing water front property for homesites. One method, recently used in Tampa Bay, Florida, is the construction of access canals that lead from open water to upland acreage. Biological and hydrological data from new upland canals together with some comparative data from older upland canals and bayfill canals are presented. In all types of canals, as presently engineered, stratified, stagnant water causes low levels of dissolved O2 in summer months, resulting in mortality or emigration among resident organisms. Means of alleviating the problems are discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-05916

PRIMARY PRODUCTIVITY IN A NUTRIENT-LIMITED TROPICAL ESTUARY,
Hawaii Inst. of Marine Biology, Honolulu.
G. Krasnick, and J. Caperon.
Pac Sci, Vol 27, No 2, p 189-196, 1973, Illus.
Identifiers: *American Samoa(Pala Lagoon), Discharges, *Estuary(Tropical), Growth, *Nitrogen, Nutrients, *Phytoplankton, *Primary productivity, Wastes.

The results of a survey of phytoplankton productivity, chlorophyll a, and nutrient concentrations in Pala Lagoon, American Samoa, are shown to be interpretable in terms of 2 regimes: an ocean-dominated region where productivity is controlled by fixed N concentrations, and a land-runoff-dominated regime where productivity is unrelated to major nutrient concentrations. A quantitative relationship between nutrient concentrations in the lagoon and phytoplankton growth rates is presented. This relationship is used as the basis for predicting the effects of a proposed dredgi operation within the lagoon as well as for predi ing the effects of increased waste discharge ir the local marine environment.--Copyright 19 Biological Abstracts, Inc.
W74-05939

MORPHOLOGICAL CHANGES IN THE LIV OF FISH (LEBISTES RETICULATUS) DURI ADMINISTRATION OF DIETHYL A DIMETHYLNITROSAMINES (IN RUSSIAN),
V. V. Khudolei.
Vopr Onkol, Vol 19, No 1, p 88-94, 1973, Illus, E glish summary.
Identifiers: Adenoma, *Cancer(Fish liver), C cinogens, Carcinoma, Cellular, Cholangioma, F liver, *Lebistes-reticulatus, Morphologi changes, *Nitrosamines, Guppies.

Aquarium guppies treated with diethyl dimethylnitrosamines, showed diffuse and fo proliferation of the hepatic tissue, benign tum (adenomas and cholangiomas) and malignant mors (cholangiocarcinomas and hepatocellu cancer). The stage character of pretumor chan in carcinogenesis, the high sensitivity of fish to hepatocarcinogenic action of nitrosamines and rationality of using fish in experimental oncol are shown.--Copyright 1973, Biological Abstra Inc.
W74-05940

RESTRUCTURING OF RIVER BANKS A SECONDARY POLLUTION: STUDY EUTROPHICATIONS IN PORT AREAS, FRENCH),
Centre d'Etudes et de Recherches de Biologie d'Oceanographie Medicale, Nice (France).
M. Aubert, J. Aubert, J-M. Pincemin, N. Desirotte, and J-P. Breittmeyer.
Rev Int Oceanogr Med. 26, p 53-64. 1972. Eng summary.
Identifiers: Bacteriology, Chemis *Eutrophication, Plankton, *Port areas, *Ri banks, *Secondary pollution, Water pollut sources.

Harbor areas, withdrawn from hydrolog exchanges with open sea, are the locality of ac mulation of substances and wastes, lead thereby, to some biological lack of balance marine environment. The physics, chemistry, b teriology and planktonology were studied. Res allowed, by statistical treatment, to point ou number of characteristic correlations of a mor less pronounced eutrophic state.--Copyright 19 Biological Abstracts, Inc.
W74-05950

5D. Waste Treatment Processes

THE MICROBIOLOGY OF ACID MINE WAT TREATMENT IN PACKED BED COLUMNS,
Pennsylvania State Univ., University Park. D of Civil Engineering.
R. F. Unz, and M. T. Lieberman.
Available from the National Technical Infor tion Service as PB-229 649, $4.00 in paper co $1.45 in microfiche. Institute for Research Land and Water Resources, Pennsylvania S University, Research Publication No. December 1973. 73 p, 19 fig, 8 tab, 36 ref. OW A-024-PA(1). 14-31-0001-4038.

Descriptors: *Waste water treatm *Ferrobacillus, *Thiobacillus ferrooxidans, *Ac mine water, *Iron bacteria, Iron compou *Trickling filters, Isolation, Disinfection, M brane filters, Sulfur, Microbiology, Microorg isms, Oxidation, Microbial degradation.
Identifiers: Ferrobacillus ferrooxidans, Packed beds, Quaternary ammonium compound, Pl counts, Microtitre plate, Thiosulfates, Ferr iron.

ercolation of acid mine water through columns of ither argillite stone or 1.5 in. (3.8 cm) olypropylene trickling filter medium resulted in xidation of constituent ferrous iron. From 87 to 6 per cent of the influent ferrous iron could be oxlized in passage of mine water through a two foot 51 cm) column of synthetic filter medium at a ydraulic loading of 1.3 gpd/sq. ft. (52.7 lpd/m2) ffective surface area of medium. Ferrous iron oxlation was mediated by chemolithotrophic bacria which were isolated and identified as hiobacillus ferrooxidans. Iron encrusted filter edium solids were found to contain organic elatinous matrices in which microorganisms were mbedded. Several heterotrophic microorganisms ere isolated from matrices and solids. Iron oxlizing bacteria but not heterotrophs were sensive to a quaternary ammonium compound and the errous iron oxidation was curtailed in disinfected lter medium. Several morphologically distinuishable iron oxidizing bacteria were isolated om mine water on solid ferrous iron culture edia although efforts to reliably enumerate the acteria using spread plating and membrane filter ulture procedures were unsuccessful. In this re-rd, it was necessary to use a microtitre plateilution dispersion technique to culture the bacria present in natural samples from which most robable number (MPN) estimates of cell numbers ould be made.
74-05409

VESTIGATION OF POROUS PAVEMENTS OR URBAN RUNOFF CONTROL,
ranklin Inst. Research Labs., Philadelphia, Pa.
. C. Grover, A. J. Hoiberg, T. I. Haigh, and E. helen.
opy Available from GPO Sup Doc as PI.16:11034 DUY 03/72, $1.25; microfiche from TIS as PB-227 516, $1.45. Environmental Protecon Agency, Water Pollution Control Research eries, March 1972. 142 p, 19 fig, 21 tab, 37 ref. PA 11034 DUY. 14-12-924.

escriptors: *Combined sewers, Treatment facilies, *Storm sewers, Water conservation, *Urban noff, Waste disposal, *Asphalt concrete, Comunity development, Solid wastes, Overflow, oads, Design, *Water pollution treatment.
entifiers: *Porous Pavements.

aboratory and economic studies were unrtaken to determine the feasibility of utilizing rous pavements to alleviate combined sewer erflow pollution and reduce the design parameers of storm sewer systems by allowing storm runoff to percolate back into the ground. Laboratory udies of candidate materials revealed a porous phaltic concrete containing 5.5% asphalt by eight and aggregate graded to allow a water flow 76 in. per hour to be the optimal porous road aterial. Materials testing for stability, durability, d freeze-thaw susceptibility proved this material itable for use in road construction. Asphalt Intute specifications were used to design roads th porous asphaltic concrete surfaces and gravel ses for varying traffic densities. Major design rameters considered were the load-bearing pacity and permeability of the subgrade, excted maximum precipitation and depth of frost netration. Roads designed with porous asphaltic ncrete were found to be generally more onomical than conventional roads with storm wers. The economics of porous pavement were ther enhanced by the added value of benefits m combined sewer overflow pollution relief, gmentation of municipal water supplies, imved traffic safety, preservation of vegetation, ief of flash flooding and the aesthetic and ectional benefits of a colored porous surface.
74-05411

SESSMENT OF THE LOSS OF RADIOACVE ISOTOPES FROM WASTE SOLIDS TO E ENVIRONMENT. PART 1: BACKGROUND D THEORY,
k Ridge National Lab.

For primary bibliographic entry see Field 5B.
W74-05419

IN-PLANT MEASURES FOR REDUCTION OF THE SPECIFIC FRESHWATER CONSUMPTION OF PAPER MILLS,
Voith (J. M.) G.m.b.H., Heidenheim (West Germany).
J. Velinsky.
Translatiovailable from Inst. of Paper Chemistry, Appleton, Wis. 54911. Price: $5.00. Institute of Paper Chemistry, Appleton, Wisc, Translation, 9 p. Trans. from Das Papier, Vol 26, No 10A, Oct 1972.

Descriptors: Freshwater, *Water consumption, *Waste water treatment, *Water reuse, Water conservation, *Pulp and paper industry, *Industrial water, Water purification, Flotation, Filtration, Sedimentation, Settling basins, Recycling, Treatment facilities, Europe, Suspended solids, Retention, Spraying, Water circulation.
Identifiers: White water, Paper machines, Savealls, *Germany, Duo-Former(Paper machine), Showers(Paper machine), Wash water, Felts(Papermaking), Tissue papers, Printing papers, Newsprint.

A survey of 15 German paper machine installations indicated that the freshwater consumption per ton of paper produced varies greatly, depending on the kind of paper manufactured (newsprint, groundwood-containing vs. groundwood-free printing and writing papers, and tissue papers), as well as on the total daily production tonnage (relatively less water being used in high-production than in low-production units). For newsprint, 160 to 735 tons of water are needed daily; for fine papers, 100 to 370 tons; and for tissues, 58 to 120 tons. Few paper mills can recirculate machine white water without clarification, because fine fibrous debris and other suspended particles (such as fillers) can clog spray pipes, papermaking felts, and shower nozzles. Among various kinds of clarifiers, scraper and funnel savealls were found superior, in general, to disk filters, but their electric power demands are higher than those of flotation or sedimentation savealls. The latter's disadvantage is the longer retention time needed. Modern paper machines, such as the Duo-Former, are designed with simplified water circuits for conservation of freshwater. Some of these circuit diagrams are illustrated. (Brown-IPC)
W74-05433

INDUSTRIAL EXPERIENCE WITH PNEUMATIC-MECHANICAL AERATORS (OBYT PRIMENENIYA PNEVMOMEKHANICHESKIKH AERATOROV V PROIZVODSTVENNYKH USLOVIYAKH),
M. A. Evilevich, B. S. Prisker, T. G. Kulikova, L. N. Braginskii, and I. Sh. Levit.
Bumazhnaya Promyshlennost', No 6, p 6-7, June 1973. 2 tab.

Descriptors: *Aeration, *Aerated lagoons, *Pulp wastes, *Treatment facilities, *Waste water treatment, Turbines, Turbulence, Biochemical oxygen damand, Industrial wastes, Equipment, Oxygen, Oxygenation, Effluents, Pulp and paper industry, Oxidation, Foreign research, Electric power.
Identifiers: *USSR(Bratsk Pulp and Paper Mill), *Turbo-aerators.

A new Turbo-aerator with improved oxidizing power for treatment of pulp and paper mill effluents was developed at the All-Union Research Institute for the Pulp and Paper Industry. In essence it comprises two turbines mounted one above the other on a vertical shaft. Air is introduced below the bottom turbines via an annular perforated distributor which disperses air finely and intensifies turbulent oxygen exchange. The top turbine stirs the upper layers of the liquid waste, improves the exchange of oxygen between air and liquid, and eliminates foam. Pilot-plant installations evidenced an oxidizing capacity of 1500 g/cu m/day and a BOD reduction of 92-94% at a power consumption of 0.5-0.7 kw-hr/kg of 5-day BOD. Commercial installation of four larger turboaerators at the Bratsk Pulp and Paper Mill was found to double the efficiency of effluent aeration tanks compared to tanks using convential perforated-tube aerators. (Stapinski-IPC)
W74-05434

PROCEEDINGS OF THIRD SANITARY ENGINEERING CONFERENCE, DISINFECTION AND CHEMICAL OXIDATION IN WATER AND WASTE TREATMENT.
For primary bibliographic entry see Field 5F.
W74-05507

THE GERMICIDAL EFFICIENCY OF SILVER, IODINE AND QUATERNARY AMMONIUM COMPOUNDS,
Public Health Service, Cincinnati, Ohio. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 5F.
W74-05510

DISINFECTION AND OXIDATION OF DOMESTIC WASTES,
North Shore Sanitary District, Waukegan, Ill.
R. E. Anderson.
In: Third Sanitary Engineering Conference on Disinfection and Chemical Oxidation in Water and Waste Treatment, conducted by Illinois Dept of Public Health and Univ of Illinois, Jan 31-Feb 1, 1961, Urbana: Univ of Illinois Bulletin, Vol 59, No 46, p 48-52, January 1962. 4 tab.

Descriptors: *Chlorination, *Chlorine, *Reviews, Disinfection, *Waste water treatment, *Water treatment, Sanitary engineering.

Adequate chlorination of sewage effluents reduces coliforms to an acceptable level. A comprehensive program of sampling, laboratory tests, and analysis of data shows that chlorination of treated effluent is essential to the safeguarding of bathing water and public water supplies in the vicinity of the effluent outfalls. (See also W74-05507) (Knapp-USGS)
W74-05512

DISINFECTION AND OXIDATION OF INDUSTRIAL WASTES,
Industrial Waste Control, Flint, Mich. Buick Motor Div.
R. J. Brink.
In: Third Sanitary Engineering Conference on Disinfection and Chemical Oxidation in Water and Waste Treatment, conducted by Illinois Dept of Public Health and Univ of Illinois, Jan 31-Feb 1, 1961, Urbana: Univ of Illinois Bulletin, Vol 59, No 46, p 53-56, January 1962.

Descriptors: *Industrial wastes, *Disinfection, *Oxidation, Sanitary engineering, *Waste water treatment, *Waste treatment.

Sodium hypochlorite is used very extensively for the destruction of cyanide wastes. When using chlorine to destroy cyanide an alkaline material must be used in conjunction in order to control the pH. Ozone is cheaper than chlorine. The requirements of 03 to destroy cyanide are at least 2.5 lb per one pound of cyanide. (See also W74-05507) (Knapp-USGS)
W74-05513

AUXILIARY USES OF DISINFECTION OXIDIZING AGENTS IN WATER TREATMENT,
American Water Works Service Co., Inc., Philadelphia, Pa.
M. E. Flentje.

In: Third Sanitary Engineering Conference on Disinfection and Chemical Oxidation in Water and Waste Treatment, conducted by Illinois Dept of Public Health and Univ of Illinois, Jan 31-Feb 1, 1961, Urbana: Univ of Illinois Bulletin, Vol 59, No 46, p 57-61, January 1962. 1 fig, 6 tab, 7 ref.

Descriptors: *Oxidation, *Water treatment, *Chlorination, Sanitary engineering, Manganese.

Oxidation is an important water treatment procedure and is the reaction involved in disinfection. Oxidation is also employed in taste and odor control, in the removal of iron and manganese, sometimes to oxidize hydrogen sulfide, and as an aid to coagulation. The most economical source of an oxidizing agent is the oxygen of the air. Chlorine dioxide, an oxidizing agent with greater capacity than chlorine, has found a definite place in water treatment. Particularly good in combating phenolic tastes and odors, it is used in dosages of from two to five pounds of sodium chlorite per million gallons. The oxidation reaction of Mn is slow and in most filtration takes place almost wholly in the filter bed itself, where it is removed by a combination of oxidation and catalysis. The speed of reaction increases as the pH of a solution increases. Potassium permanganate is a fast-acting, powerful oxidizing agent that can be used in neutral or slightly alkaline pH ranges. This chemical, in some cases, could displace both some Cl and Cl02 in taste and odor control and for Mn removal. (See also W74-05507) (Knapp-USGS)
W74-05514

SURVEY OF WASTEWATER FACILITIES AND RECEIVING WATERS AND PROPOSED PERFORMANCE SPECIFICATIONS, MCGUIRE AFB AND FT DIX, NEW JERSEY, VOLUMES I AND II,
Environmental Health Lab., Kelly AFB, Tex.
J. W. Tremblay, and N. J. Lamb.
Available from NTIS, Springfield, Va. 22151 as AD-766 895, and AD-766 896, for $3.00 printed copy (each vol.); $1.45 in microfiche. Technical Report EHL(K) 73-12, July 1973. 362 p (Vol I-58p; Vol II-304p), 7 fig, 24 tab, 12 ref, 9 append.

Descriptors: *Military reservations, *Sewage treatment, *Water pollution control, *New Jersey, Water pollution sources, *Waste water treatment, Public health, *Treatment facilities.
Identifiers: McGuire AFB(NJ), Fort Dix(NJ).

A field wastewater survey was conducted at McGuire AFB and Ft Dix, New Jersey in September 1972. Extensive physical, chemical and biological sampling and analyses of the sewage treatment plants and the surface waters to which the plants discharge were accomplished. The quality of the receiving waters is degraded as a result of the sewage plant discharges. These two federal facilities should join in efforts to create a regional wastewater management system, and until then maintain the existing secondary sewage treatment facilities with minimum expenditure of capital investment funds. Performance specifications are proposed for the interim period, and recommendations for interim upgrading of the existing facilities are made. Alternative courses of action are evaluated in the event the regional management system does not materialize. (Knapp-USGS)
W74-05530

GROUNDWATER RECHARGE WITH TREATED WASTEWATER,
Wisconsin State Univ., Oshkosh. Dept. of Geology.
C. W. Fetter, Jr., and R. G. Holzmacher.
Journal of Water Pollution Control Federation, Vol 46, No 2, p 260-270, February 1974. 77 ref.

Descriptors: *Waste water disposal, *Water reuse, *Artificial recharge, Water spreading, Injection wells, Waste disposal wells, Reclaimed water, Clogging, Bacteria, Viruses.

Artificial recharge of aquifers is a proven method for conservation of groundwater resources. The use of open basins, stream channels, and spray irrigation is possible with a typical secondary effluent, but recharge through wells requires wastewater of higher quality. Very slight turbidity and bacterial growths may lead to rapid clogging of recharge wells. Recharge of a fine- or medium-grained aquifer does not seem to lead to problems caused by pathogenic bacteria or viruses if the water travels several hundred feet and the aquifer is not fissured. Water quality improvement may also be effected by physical and biological processes in the soil. (Knapp-USGS)
W74-05552

THE BEHAVIOR OF PARTICULATE MATERIAL IN THE TREATMENT LAGOONS OF A BLEACHED KRAFT PULP MILL,
Bedford Inst., Dartsmouth (Nova Scotia). Atlantic Oceanographic Lab.
J. M. Bewers, and G. J. Pearson.
Water Air Soil Pollut, Vol 1, No 4, p 347-358, 1972, Illus.
Identifiers: *Particulate matter, *Pulp wastes, *Treatment lagoons, Industrial wastes, Water pollution sources, *Waste water treatment.

The effect of treatment lagoons on the suspended particular matter contained in Bleached Kraft Mill Effluent was studied. Good settling characteristics for coarse material were found, but fine particles remained in suspension throughout the system. When the treated effluent was discharged into the brackish water of a narrow tidal cove, the increased ionic strength of the medium promoted the combination of fine particles. This flocculation effect produced a larger concentration of coarse material in the treated effluent than was contained in the raw mill discharge. A procedure for artificial flocculation, within the treatment system was suggested as a method of improving both the treatment efficiency and the physical properties of the effluent released to the marine environment.--Copyright 1973, Biological Abstracts, Inc.
W74-05615

COST EFFECTIVENESS OF REGIONAL WASTEWATER SYSTEMS,
Environmental Protection Agency, Washington, D. C. Systems Application Section.
W. N. Fitch.
In: Proceedings of a National Symposium on Costs of Water Pollution Control, April 6-7, 1972, Raleigh, North Carolina, p 67-89. 12 fig, 2 tab.

Descriptors: *Waste water disposal, *Waste water treatment, *Costs, *Treatment facilities, Water quality standards, Water pollution, Municipal wastes, Septic tanks, Social aspects, Population, Future planning(Projected), Management, Environmental effects, Construction.
Identifiers: Module construction, Cost effectiveness, Soil absorption systems.

In order to improve the efficiency and effectiveness of wastewater systems, water quality management planning must precede facility construction. Goals must be set, and the effectiveness of the project must be determined from the perspective of costs, social effects, and environmental impact. More efficient means of constructing facilities would result if the uncertainties of future flow projections were reduced. The four primary factors which determine future waste treatment needs are population growth, extensions in domestic sewer coverage, new industrial connections, and a change in per capita waste generation. The uncertainty of population growth in a community is illustrated by census data for the decade 1960-1970. Module construction is the means suggested to deal with the uncertainty of waste treatment demand. This type of construction would provide the flexibility to respond to new technology or a change in the community growth pattern. A smaller community might find it more economical to improve its present soil absorption syste rather than provide an expensive collecti system. (See also W74-05629) (Pinsky-Wisconsin
W74-05632

COST EFFECTIVENESS OF CURRENT E VIRONMENTAL ENGINEERING PRACTICES
Camp, Dresser McKee, Boston, Mass.
For primary bibliographic entry see Field 5G.
W74-05633

ECONOMIC GUIDELINES FOR ANALYSIS C JOINT INDUSTRIAL-MUNICIPAL COLLE TION AND TREATMENT SYSTEMS,
Quirk, Lawler and Matusky Engineers, Tappa N.Y.
T. P. Quirk, and J. E. Shirk.
In: Proceedings of a National Symposium Costs of Water Pollution Control, April 6-7, 197 Raleigh, North Carolina, p 114-135. 3 fig, 7 ref.

Descriptors: *Waste treatment, *Industr wastes, *Treatment facilities, *Economic feasibi ty, Municipal wastes, Costs, Economics, Taxe Capital costs, Effluents, Operating costs, Pr treatment(Water), Methodology, Intercept sewers.
Identifiers: Joint industrial-municipal waste tre ment systems, Rate-making.

The economic factors which influence an indu try's decision whether to construct independe treatment facilities or to participate in a joint dustrial-municipal facility may be generaliz from EPA sponsored studies of the desi procedures and cost experiences in industrial a municipal waste treatment practices. One det mining economic factor is the pretreatment co for industrial effluents, with the requirement f pretreatment optimally based upon specific was water characteristics. Another factor to be co sidered is the tax relief provided industry by a celerated depreciation for the capital costs of dustrial treatment facilities, which is equivalent a construction grant of 17 percent. A third fac that must be considered is that traditional, m nicipal design practices include treatment facilit not normally included in an industrial facility, ra ing the capital cost of a joint treatment plant from 20 to 25 percent over that of an industr facility. A fourth consideration is the economies scale and consolidation which is estimated on t average to entail a 20 percent reduction in u construction and operating cost as wastewa flow doubles. Additional economic factors wh must be considered are interceptor costs and t rate-structure philosophy. (See also W74-056 (Pinsky-Wisconsin)
W74-05634

EFFECTIVE POLLUTION CONTROL INVES MENT,
Environmental Protection Agency, Washingto D.C. Div. of Municipal Waste Water Programs.
R. C. Palange.
In: Proceedings of a National Symposium Costs of Water Pollution Control, April 6-7, 197 Raleigh, North Carolina, p 149-157.

Descriptors: *Waste treatment, *Investmen *Water pollution control, *Municipal waste Treatment facilities, Federal Water Pollution Co trol Act, Federal Government, Sewers, Sewa treatment, Technology, Design, Constructio Population, Operation and maintenance, Gover ment finance.
Identifiers: *Cost effectiveness, Municipal was water treatment.

The municipal wastewater treatment facilities co struction program, which provides for the co struction of waste treatment works, is direct toward three major goals: (1) to help bring wa pollution from municipalities under control achieving a rate of construction which will ov

come the unmet backlog of needed facilities; (2) to keep pace with needs for new facilities resulting from population growth; and (3) to match the need to replace facilities which become obsolete because of age, technical advancement, or population shifts. Some waste treatment facilities built under this program were not as successful as expected due to failure to utilize new technology and improved design practices, poorly trained operators, inadequate plant maintenance, and inefficient plant operation. The cost effectiveness of the program suffers from excess sewer connections and excess plant capacity. More efficient utilization of capital and an alternative investment procedure could result in more rapid progress in pollution abatement with higher cost effectiveness. (See also W74-05629) (Pinsky-Wisconsin)
W74-05635

THE PRESENT AND FUTURE MARKET FOR POLLUTION CONTROL EQUIPMENT,
Business and Defense Services Administration, Washington, D.C. Water Resources and Engineering Services Div.; and Bureau of Domestic Commerce, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05636

INDUSTRY VARIANCE OF CONSUMER PRICES AND COMPETITION AS A CONSEQUENCE OF WATER POLLUTION ABATEMENT,
Auburn Univ., Ala., School of Business.
H. B. Pickle, and A. C. Rucks.
In: Proceedings of a National Symposium on Costs of Water Pollution Control, April 6-7, 1972, Raleigh, North Carolina, p 218-229. 1 fig, 4 tab.

Descriptors: *Water pollution control, *Competitive prices, *Textiles, *Steel, *Alabama, Effluents, Costs, Unemployment, Waste water treatment, Industrial wastes, Foreign trade, Economic impact.
Identifiers: Consumer prices.

Increased costs to industry associated with the installation of effluent treatment facilities could seriously disturb a firm's competitive position. The rise in per unit costs must be either absorbed by the producer, passed on to the consumer, or partially absorbed and partially passed on. The effect of water pollution abatement expenditures on competition in an industry depends on factors such as transportation costs, degree of labor costs, and unit price. A study of the textile industry in Alabama found that the costs of pollution abatement could not be passed on to the consumer. This is due to the small size of most textile producers, the relatively homogeneous products produced, and foreign competition. A firm that tried to raise prices to cover the costs of waste water treatment would lose between 24 and 36 percent of its market to other domestic firms, and between 14 and 17 percent to imports. In the steel industry, pollution abatement is more costly and difficult than in the textile industry. Profits are not sufficient to cover the costs of both cleaning up the environment and modernizing facilities. If the increased costs were passed on to consumers, imports would increase and domestic unemployment would rise. (See also W74-05629) (Pinsky-Wisconsin)
W74-05640

BENEFIT-RELATED EXPENDITURES FOR INDUSTRIAL WASTE TREATMENT,
Syracuse Univ., N.Y. Dept. of Civil Engineering.
N. L. Nemerow.
In: Proceedings of a National Symposium on Costs of Water Pollution Control, April 6-7, 1972, Raleigh, North Carolina, p 230-246. 2 fig, 2 tab.

Descriptors: *Waste treatment, *Industrial wastes, *Cost-benefit ratio, *Economic justification, Water pollution, Marginal income, Marginal costs, Pulp and paper industry, Recreation, Income, Waste water disposal, Water utilization, Methodology, Costs, Benefits.
Identifiers: *Industrial waste treatment, Economic stability.

Industrial waste treatment and economic stability are both desirable goals which at times may be mutually exclusive. Waste treatment may cost more than an industrial plant can afford, forcing either pollution to be allowed or a loss of jobs and income. This raises the question of whether pollution abatement costs are justifiable. Dollar benefits of a clean water resource can be derived by evaluating recreation use benefits, withdrawal water use benefits, wastewater disposal benefits, land value benefits, and in-stream water use benefits. The total cost of maintaining that water quality level can be compared to the benefits derived. This enables the computation of a per unit charge for a pollution carrying capacity which can be applied to industrial wastes. Two industrial economics ratios have potential application in water pollution abatement. These include the relationship of waste treatment costs to production costs, and the cost of waste treatment for each 1000 gallons of waste treated. A feasible method of determining a firm's financial capability to provide waste treatment is illustrated. (See also W74-05629) (Pinsky-Wisconsin)
W74-05641

COSTS OF WATER POLLUTION CONTROL IN THE CHEMICAL INDUSTRY,
Datagraphics, Inc., Pittsburgh, Pa.
H. C. Bramer.
In: Proceedings of a National Symposium on Costs of Water Pollution Control, April 6-7, 1972, Raleigh, North Carolina, p 247-254. 2 ref.

Descriptors: *Water pollution control, *Waste treatment, *Chemical industry, Industrial wastes, Treatment facilities, Capital costs, Operating costs.
Identifiers: Plant size, Joint industrial-municipal treatment plants, In-plant treatment.

The costs that would be incurred by the organic and inorganic chemical industries in attaining levels of water pollution abatement through 1973 are summarized. Production in the organic chemical industry was estimated at 120.7 billion pounds in 1969 and 156.0 billion pounds in 1973. The principal contaminates are BOD, COD, oil, suspended solids, acidity, heavy metals, color, taste and odor producing compounds and residual organic products and by-products. While joint industry-municipal waste treatment has proved effective, especially for smaller plants located near large municipal treatment systems, separate treatment has been shown to have economic advantages. Production in the inorganic chemical industry was estimated at 328.7 billion pounds in 1969 and projected at 455.5 billion pounds for 1974. Pollution control expenditures may affect this industry to a greater extent, because of a recent fall in the overall price index. Contaminates come primarily from electrolysis and crystallization brines, washings from filter cakes, spent acid and alkalies, and washings from raw materials. The inorganic chemical industry has also generally found that in-plant, separate waste treatment facilities have economic advantages, particularly when large quantities of waste water are involved. Data is presented for the operating and capital costs of various treatment levels. (See also W74-05629) (Pinsky-Wisconsin)
W74-05642

COSTS OF WATER POLLUTION CONTROL IN THE PAPER INDUSTRY,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
I. Gellman.
In: Proceedings of a National Symposium on Costs of Water Pollution Control, April 6-7, 1972, Raleigh, North Carolina, p 255-270. 9 tab, 3 ref.

Descriptors: *Water pollution control, *Pulp and paper industry, *Cost-benefit analysis, *Economic impact, Water quality, Capital costs, Waste treatment, Waste water treatment.
Identifiers: Zero discharge.

The water pollution control costs of the paper industry have risen significantly between 1959 and 1972. During this time capital expenditures rose from $100 million to $816 million and annual charges rose from $14 million to $122 million, while the treatment costs rose from 0.75 to 6.4 cents per 1000 gallons. The A. D. Little estimate of treatment costs would result in a median price increase for paper products of $8.5 per ton or 5.5 percent. Also, the industries capital spending for pollution control could reach 40 percent of total capital outlays. A zero discharge treatment requirement could result in a 50 percent increase in product cost to the public. With these treatment costs rising, cost-benefit analyses must begin to take into account the benefits resulting from the institution of pollution control measures and allow for the physical quantification of improvements in water quality which result from pollution control expenditures, in order to be a realistic tool for management decision making. (See also W74-05629) (Pinsky-Wisconsin)
W74-05643

SOIL STORAGE LIMITATIONS ON EFFLUENT IRRIGATION,
Missouri Univ., Columbia. Dept. of Forestry.
C. D. Settergren.
Water Resources Bulletin, Vol 8, No 6, p 1273-1276, December, 1972. 2 fig, 9 ref.

Descriptors: *Sewage treatment, *Sewage disposal, *Waste water disposal, Pollution sources, Irrigation, *Water reuse, Recycling.

Over 23 billion gallons of sewage effluent are discharged in the United States each day. Increasingly strict water quality laws make effluent irrigation more inviting. At an application level of two inches per week, 129 acres are required to dispose of one million gallons of waste water per day. Dangers do exist and are delineated. With careful planning and reconnaissance, the disposal site can be selected to allow for more favorable disposal and renovation potential through irrigation. (Skogerboe-Colorado State)
W74-05676

REMOVAL OF MERCURY COMPOUNDS FROM WATER,
Phillips Petroleum Co., Bartlesville, Okla. (assignee).
R. P. Williams.
U.S. Patent No. 3,769,205, 3 p, 2 tab, 14 ref; Official Gazette of the United States Patent Office, Vol 915, No 5, p 1843, October 30, 1973.

Descriptors: *Patents, Industrial wastes, Mercury, *Sulfides, Chemical reactions, Pollution abatement, Water quality control, Water pollution control, *Heavy metals, *Separation techniques, *Waste water treatment.
Identifiers: Disulfides, Hydrocarbyl sulfide, *Mercury compounds.

By contacting an aqueous mixture contaminated by dissolved mercury compounds with a water insoluble organic sulfide or disulfide, preferably a hydrocarbyl sulfide or disulfide, all but minor amounts of the mercury contaminant can be removed from the water. The organic layer can be separated from the water layer. If desired, mixtures of one or more sulfides or disulfides or a mixture of a sulfide and disulfide may be employed as the extraction agent. (Sinha - OEIS)
W74-05684

METHOD OF TREATING WASTE WATER THROUGH ELECTROLYSIS,
Mitsui Mining and Smelting Co., Ltd., Tokyo (Japan). (assignee).
M. Ichiki, and M. Ishii.
U.S. Patent No. 3,769,186, 4 p, 2 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 915, No 5, p 1839, October 30, 1973.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, *Water purification, *Oil pollution, *Heavy metals, Suspended solids, *Electrolysis, Aluminum alloys, Pollution abatement, Water quality control, Water pollution control, Ions.

A method is described of treating waste water which is characterized by the purification of the industrial waste water containing at least one member of the group consisting of oil, emulsion, heavy-metal ion and suspended solid matter through electrolysis employing an aluminum alloy as the anode. Use of an aluminum alloy as the anode for electrolysis makes it possible to function continuously and for a long period of time by checking the rise in cell voltage. (Sinha - OEIS)
W74-05685

MICROBIAL DEGRADATION OF PETROLEUM,
Bioteknika International, Inc., Alexandria, Va. (assignee).
E. N. Azarowicz.
U.S. Patent No. 3,769,164, 7 p, 4 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 915, No 5, p 1835, October 30, 1973.

Descriptors: *Microbial degradation, *Biological treatment, *Patents, Oil spills, *Oil pollution, Bacteria, Actinomycetes, Yeasts, Fungi, *Microorganisms, Pollution abatement, Water quality control, Water pollution control, *Waste water treatment.
Identifiers: Petroleum, Crude oils, Hydrocarbons.

Selected bacteria, actinomycetes, yeasts, and filamentous fungi break down crude petroleum, thus they can convert masses of spilled oil into masses of edible, nontoxic living cells. The microorganisms are special species that have been mutated to achieve the objectives of the invention. They have been deposited with the American Type Culture Collection in Rockville, Md. and are given ATCC catalogue numbers. (Sinha - OEIS)
W74-05686

SLUDGE TANK WITH SELF-CLEANING SCREEN AND SCREEN FOR USE THEREIN,
Clarkson Industries, Inc., New York. (assignee).
D. H. Hoag.
U. S. Patent No. 3,768,657, 4 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 915, No 5, p 1717, October 30, 1973.

Descriptors: *Patents, *Filters, *Sedimentation, *Waste water treatment, *Sludge treatment, Pollution abatement, Water quality control, Water pollution control, *Screens, *Settling basins.

The conveyorized sludge tank is the type in which relatively coarse objects are separated by sedimentation from a liquid medium in which they are suspended and then removed from the tank by the flights of a moving conveyor positioned partially within the tank. The tank is provided with a screen mounted at the bottom of the tank for swinging motion toward and away from the flights of the conveyor and adapted to lean against a course of the conveyor to cause the conveyor flights to continuously wipe the filtering surface of the screen. The screen is preferably formed in sections, each of which has spaced filtering strips and the filtering strips of adjacent sections diverge to form a herringbone pattern that minimizes and equalizes wear on the conveyor flights. (Sinha - OEIS)
W74-05687

IMPROVED PROCESS FOR TREATMENT OF AQUEOUS SUSPENSIONS,
K. A. Kraus.
Available from NTIS as PAT-APPL-148132(70); $3.00 paper copy, $1.45 microfiche. Atomic Energy Commission Patent Application Serial No. 148,132(70), May 28, 1971. 8 p, 2 tab.

Descriptors: *Patents, *Filtration, *Filters, *Waste water treatment, Separation techniques, Water quality control, Pollution abatement, Equipment, Water pollution control.
Identifiers: *Water clarification.

To maximize the benefits of cross-flow filtration, a method is provided for continuous removal of the surface cake or surface film which builds up on the filter during cross-flow filtration of a slurry at a minimal fluid velocity with or without a salt-rejecting membrane deposited on the filter. A method of treating aqueous waste streams for the purpose of removing a soluble or dispersed moiety comprises passing the stream through a vertically disposed, porous, permeable material which contains a zone of fluidization and a solid fluidizing medium in the zone at a velocity sufficient to affect transpiration of a purified water product through the material. Cake buildup can be effectively eliminated if cross-flow filtration is allowed to take place in a vertically disposed permeable filter hose in the presence of a fluidized bed of solid abrasive particles which have the capacity to remove the bulk of any deposited solid cake. (Sinha - OEIS)
W74-05690

RAW LIQUID WASTE TREATMENT SYSTEM AND PROCESS,
Jet Propulsion Lab., Pasadena, Calif.
M. F. Humphrey.
Available from NTIS as N73-31011, $3.25 paper copy, $1.45 microfiche. National Aeronautics and Space Administration Patent Application Serial No. 390,467, August 22, 1973. 21 p, 2 fig.

Descriptors: *Patents, *Waste water treatment, *Organic wastes, *Liquid wastes, Activated carbon, Pollution abatement, Water quality control, Water pollution control, *Sewage treatment, *Settling basins.

In the process, substantially all the non-dissolved matter in the raw sewage is first removed from the sewage water in a primary settler. The separation is facilitated by the addition of partially used activated carbon and ash material which was already used downstream. The sewage water from which the non-dissolved matter was removed is directed to a secondary settler. This water contains dissolved organic matter. The separated non-dissolved matter together with the used activated carbon and ash material from the primary settler are filtered to remove the water and are then supplied to a pyrolysis reactor where they are converted into fresh activated carbon and ash material. The latter, in the form of a primary slurry, is combined in a settler with the water in which organic matter is dissolved. The fresh activated carbon and ash material desorbs the dissolved organic matter and thereafter is returned upstream to the primary settler to facilitate the separation of the non-dissolved matter from the incoming raw sewage. The novelty resides in the formation of the activated carbon and ash material from the sewage contaminants without the addition of any reagents and, more particularly, in the use of this material first downstream to remove dissolved organic matter and only thereafter upstream to facilitate the removal of non-dissolved matter from the incoming raw sewage. (Sinha - OEIS)
W74-05692

SEWAGE: THE SURPRISING RESOURCE,
California Attorney General's Environmental Task Force, Sacramento.
W. Marx.
The Nation, Vol 216, p 588-591, May 7, 1973.

Descriptors: *Water reuse, *Sewage treatmen *Sewage disposal, *Reclamation(Waste water *Reclaimed water, Irrigation practices, Domest wastes, Industrial wastes, Tertiary treatmen Waste water treatment, Water resources manage ment, Water allocation, Water resources, Wat quality, Effluents.
Identifiers: *Sewage salvage.

Sewage salvage or water reclamation may outstri weather modification, sea-water conversion, an other methods as the most feasible new wat source. Changing aspects of both water manage ment and sewage treatment make water reclam tion more plausible. Sewage treatment is divide into primary, secondary, and tertiary levels. Th main obstacle to water reclamation is more instit tional than technical. Irrigation of crops and park has become a common way to use reclaimed wat particularly in arid areas. Industry is anothe potential user of reclaimed water. Some wat management agencies belittle water reclamatio and prefer to divert water from another region t satisfy their water gluttony. Water reclamation stimulating institutional reforms--to adopt to a era of limited resources. Reclamation, however no panacea for America's water problem. The N tional Industrial Pollution Control Council re ported that water withdrawals would exceed th maximum supply shortly after 1980. (Sperlin Florida)
W74-05794

CONSTRUCTION OF WASTEWATER FACILITIES, LUFKIN, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Federal Highway Administration, Austin, Tex.
Available from National Technical Informatio Service, Springfield, Va. 22151, as PB-204 907-F $3.00 paper copy, $1.45 microfiche. February 1972. 188 p, 12 tab, 13 map, 1 illus, 1 chart.

Descriptors: *Environmental effects, *Wast water treatment, *Treatment facilities, Publi health, Environmental sanitation, Sewag disposal, Waste water(Pollution), Sewage e fluents, Interceptor sewers, Pumping plant Sewage, Sludge treatment, Pipelines, Alternativ planning, Alternative costs, *Texas.
Identifiers: *Environmental Impact Statements *Lufkin(Tex).

This project consists of constructing sanitar sewer interceptors, pumping stations, force mains waste treatment facilities, and appurtenance within and near the city of Lufkin, Texas. Th proposed project is designed to provide waste water facilities to meet anticipated demands of fu ture development. It is intended to relieve the ex isting inadequate facilities, the effluents of whic are currently polluting the receiving streams an creating health hazards. Alternative proposal which were considered include using tw processing systems and the feasibility of combin tion of new facilities and utilization of existin facilities. Any adverse effects on the environmer that will result from the construction and opera tion of the new facilities should be minimal whe compared to the benefits received by the loc population and to the ecological enhancement tha will be realized. (Conko-Florida)
W74-05814

PAPER'S POLLUTION PROBLEMS.
For primary bibliographic entry see Field 5B.
W74-05817

MASTER PLANNING METHODOLOGY FOR URBAN DRAINAGE,
Rice (Leonard) Consulting Water Engineers Denver, Colo.
For primary bibliographic entry see Field 6A.
W74-05834

A MATHEMATICAL MODEL FOR AEROBIC DIGESTION,
National Environmental Research Center, Cincinnati, Ohio.
R. Smith, R. G. Eilers, and E. D. Hall.
Available from NTIS Springfield, Va 22151 as PB-222 029 Price $3.75 printed copy; $1.45 microfiche. EPA National Environmental Research Center, Cincinnati, Ohio, Publication, July 1973. 45 p, 9 fig, 5 tab, 12 ref, append.

Descriptors: *Aerobic treatment, *Waste water treatment, Computer programs, Sewage treatment, Design, Costs, *Activated sludge, *Mathematical models, *Sludge treatment, Sludge disposal.
Identifiers: *Aerobic digestion.

Design and cost relationships for various modifications of the aerobic digestion process for disposal of waste organic sludges were studied in a mathematical model. The aerobic digester can be operated on a continuous basis with a settler or on a fill and draw basis, for reducing the volume of waste activated sludge only or for digesting a combination of primary and waste activated sludge. The concentrations of other constituents such as phosphorus and nitrogen in the effluent streams were calculated. (Knapp-USGS)
W74-05856

HANDBOOK FOR MONITORING INDUSTRIAL WASTEWATER.
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
For primary bibliographic entry see Field 5A.
W74-05862

A REVIEW OF WASTEWATER PROBLEMS AND WASTEWATER MANAGEMENT PLANNING IN THE SAN FRANCISCO BAY REGION, CALIFORNIA.,
Geological Survey, Menlo Park, Calif. Water Resources Div.
W. G. Hines.
Open-file report. January, 1973. 54 p, 8 fig, 16 tab, 3 append, 33 ref.

Descriptors: *Municipal wastes, *Waste water treatment, Waste water, *Waste treatment, *Waste water disposal, *California, Water pollution, Water pollution treatment, Water treatment, Waste disposal, Pollution, Long-term planning, Water quality, Toxicity, Pesticides, Water pollution effects, Reviews.
Identifiers: *Waste water management, *San Francisco Bay Area(Calif.), Regional planning, Municipalities.

Various agencies are engaged in comprehensive management planning for the San Francisco Bay Region. Initial objectives are consolidation and coordination of facilities and the elimination of wastewater discharges in ecologically sensitive areas. Quantities of wastewater discharged in the area are enormous and continually increase with population and economic growth and urban development. Total volume of pollutants contained in wastewater discharges, as measured by BOD (biochemical oxygen demand), biostimulant concentrations, and toxicity has increased despite large expenditures for new treatment facilities. Pollutants from other sources, such as agriculture and storm water runoff, have increased. Comprehensive programs propose industrial and municipal wastewater management for waste now discharged into the Bay with interim and long-range plans. Priority is placed on constructing wastewater-conveyance facilities to transport wastewater from areas where pollution is most acute. Local and sub-regional goals must be identified and evaluated to coincide with long-range state and federal wastewater management goals. Public awareness and participation is important for effectiveness of a management program due to interaction of social, economic, and environmental factors. (Grden-North Carolina)
W74-05863

WATER AND SEWER NEEDS OF LOW INCOME FAMILIES FOR THE MID-CUMBERLAND REGION OF TENNESSEE.
Mid-Cumberland Council of Government, Nashville, Tenn.
Available from the National Technical Information Service as PB-221 741; $4.25 in paper copy, $1.45 in microfiche. Final Report No. M-COG-1002-4. April, 1973. 36 p, 6 tab. CPA-TN-33-1002-308.3. CPA-TN-33-1002.

Descriptors: *Sewers, Water distribution(Applied), *Water costs, *Water demand, Water policy, Public utility districts, Cities, Planning, *Tennessee, *Plumbing.
Identifiers: *Low-income households, Mid-Cumberland Region(Tenn.), Public Service Commission, Federal incentive programs, Matching funds, Plumbing fixtures, Nashville(Tenn.).

Families living in the Mid-Cumberland Region with incomes under $4000 per year comprise 13.25% of the total number. Plumbing fixtures are absent from 10.2% of the households. A county-by-county breakdown of these percentages indicates a high correlation between the presence of low income families and households lacking in plumbing facilities. Several factors contribute to this situation. First, low income districts are not readily annexed into a city's or district's service area due to the low tax return expected or the area's inability to pay for services. Secondly, the Public Service Commission has no jurisdiction over utility districts, only municipalities. Consequently, the provision of water and services in utility districts is not responsive to the wishes of the public, but rather is a function of the market. A set of countywide water and wastewater commissions having jurisdiction only within their county would alleviate this problem, making the decision to provide services a political one and thus subject to the normal political processes. Thirdly, low income families are frequently unable to connect to nearby water and sewer lines due to high tap fees. The tremendous cost of installing plumbing fixtures is another deterent. The HUD water and wastewater facilities program provides an incentive for local matching money for areas with populations less than 10,000, within a SMSA, with unemployment twice the national average, and with poor or blighted conditions. Use of this program in low income areas would encourage the lowering of tap fees for qualified low-income families. (Hoffman-North Carolina)
W74-05870

SHAWNEE COMPREHENSIVE PLAN, WATER WORKS SYSTEM AND SANITARY SEWERAGE SYSTEM,
Benham-Blair and Affiliates, Inc., Oklahoma City.
E. M. Fry.
Available from the National Technical Information Service as PB-222 271; $4.25 in paper copy, $1.45 in microfiche. Memorandum No. 4, Final report. Prepared for Office of Community Affairs and Planning, Oklahoma City, Okla. January, 1973. 36 p, 7 fig, 5 tab, append. CPA-OK-06-56-1015.

Descriptors: *Comprehensive planning, *Waste water treatment, *Sewage treatment, *Water distribution(Applied), Water consumption, Water management(Applied), *Oklahoma, Water pollution, Sewerage, Long-term planning, Computer models.
Identifiers: *Shawnee(Okla), Oklahoma City(Okla).

The water and sewer portions of the Shawnee Comprehensive Plan are updated. Population will increase from 25,075 in 1970 to 32,480 or 33,980 by 1995, with most growth in the urbanizing area. Water consumption in 1972 was 100 gallons per capita per day, and 125 gallons are projected for 1995. Sanitary sewage flow is 88 gallons/day and is expected to increase slightly. Computer analysis is done for the water distribution system by simulating the pipe network; reduced pipe capacities due to encrustation appear. Essential features of the water and sewer system Master Plan for the 20-year period include a new raw water source by 1985, increased water treatment capacity, new trunk mains to improve water distribution, a minimum size of 12 inches for new mains, elevated storage, new treatment facilities north of the city, and new gravity sewers to eliminate the need for lift stations. A development program consists of five-year periods for planning initiation and orderly system expansion. (Grden-North Carolina)
W74-05871

SCAPE; A COMPUTER MODEL FOR ALTERNATIVE SEWER SYSTEM COST EVALUATION,
Southwestern Pennsylvania Regional Planning Commission, Pittsburgh.
J. P. DeAngelis, and R. A. LaMacchia.
Available from the National Technical Information Service as PB-224 717; $5.00 in paper copy, $1.45 in microfiche. December, 1972. 58 p, 9 fig, 5 tab. 93009335. Pa-P242.

Descriptors: *Computer models, Mathematical models, *Cost-benefit analysis, *Feasibility studies, Model studies, Cost allocation, *Costs comparison, Project planning, *Pennsylvania, Water policy, Waste water treatment, Waste disposal, Sewage, Sewage disposal, Sewerage, Sewage treatment, *Sewers, Water treatment.

SCAPE (Sewer Costs for Alternative Plan Evaluation), an analytic computer technique programmed in FORTRAN IV, estimates sewage system construction and operating costs to determine the least cost sewer system configuration. Given an area to be sewered, the number of people and workers to be served, a topographic map describing the area, analysts can devise alternative sewer service configurations and test them for least cost. A single expected cost and a cost range, based on the prediction interval of the cost estimating equations, is produced for each alternative. By comparing cost ranges of several alternatives, one determines if he has a statistically valid least cost solution or only an approximate one which arises when cost ranges of the lowest cost solutions overlap. This means a least cost solution cannot be statistically valid. The model also estimates sewage flow, pipe size, and slopes for alternatives. Alternatives may include gravity or forced flow, a system or combination of systems, and a variety of treatment facilities depending on the required effluent quality. It is possible to operate SCAPE in conjunction with a stream quality model to obtain best solutions from both a cost and pollution abatement standpoint. (Grden-North Carolina)
W74-05873

REGIONAL WATER AND SEWER CAPITAL IMPROVEMENTS PROGRAM.
Northwest Missouri Regional Planning Commission, Maryville.
Available from the National Technical Information Service as PB-223 792; $3.00 in paper copy, $1.45 in microfiche. Report No. NWMRPC-73-303. June, 1973. 10 p, 7 tab. Mo. P-200/SA-190.

Descriptors: *Management, *Sewage treatment, *Missouri, Costs, Sewage districts, Financing, Long-term planning, Sewage disposal, Waste treatment, Sewerage, Waste water treatment, Water quality, Waste water disposal, Waste disposal, *Regional analysis, *Sewers.
Identifiers: Regional planning, Capital investment, *Capital improvements.

The Northwest Missouri Regional Planning Commission, as part of its continuing planning and management program, maintains a Capital Improvement Program, with water and sewer im-

provements for the region described here. It updates the 1970 Comprehensive Plan for Water and Sewer Development. This report aids the Commission in judging timeliness of applications for federal assistance, lends support to individual improvement attempts, and notifies state and federal funding sources of the type, scope, cost, and timing of projects needing their assistance. Cities needing new sewage facilities and renovation of existing facilities, improvement of force mains, and improvements in collection systems by 1990 are specified, at a cost of $9,000,000. Six Rural Water Districts needed by 1975 are specified at a cost of $2,750,000, and 13 districts to be needed by 1990, are estimated to cost $5,595,000. Improvements can be financed through general revenue sharing funds, federal and state loans and grants, general obligation bonds, and revenue bonds. (Grden-North Carolina)
W74-05874

PRELIMINARY FEASIBILITY STUDY FOR THE POJOAQUE VALLEY SEWERAGE SYSTEM.
Northern Area Planning Organization, Sante Fe., N. Mex.
Available from the National Technical Information Service as PB-224 780; $4.50 in paper copy, $1.45 in microfiche. August, 1973. 70 p, 10 tab, 3 fig, 1 append. CPA-NM-1004-LP/D2.5.

Descriptors: *Sewage treatment, *Cost analysis, Cost-benefit analysis, *Feasibility studies, *Waste water treatment, *Indian reservations, Project planning, *New Mexico, Sewerage, Sewage disposal, Water quality, Long-term planning, Sanitary engineering.
Identifiers: *Pojoaque Valley(New Mexico), Waste water management, Santa Fe(New Mexico), Regional planning, Pueblo Indian grants.

Cost figures and preliminary design information for a comprehensive sewerage system to serve Pojoaque Valley, New Mexico area, approximately 16 miles north of Santa Fe, are presented. Total proposed project covers an area of about ten square miles, mostly in the alluvial plains of the Pojoaque River, Rio Tesuque and the Pojoaque Creek. Valley population is expected to double in two decades. Preliminary construction cost estimates range from $4,000,000 to $6,000,000. Operation and maintenance would cost $41,000 per year, and with grants from state and federal governments, cost per customer would range from $5 to $16 per month. However, without full participation of communities, cost per home would increase. Sinking funds are also needed to replace worn equipment and cover debt repayment. Financing through federal and state grants and general revenue sharing bonds can be used. Before proceeding further, other information is needed, including involvement of Pueblo Indian Tribal officials with easement rights, investigation of participation which can be expected in granting easements and paying for house connections, investigation of water quality to ascertain the degree and extent of surface and groundwater contamination from septic tanks, investigation of treated waste water reuse, definition of proposed sewer district boundaries and sewer ordinances, investigation of funding programs, establishment of a coordinating committee, and investigation of total value of assessed property in involved communities to determine possible bonding capacity of the sewer association. (Grden-North Carolina)
W74-05875

WATER SUPPLY AND WATER POLLUTION CONTROL CAPITAL PROGRAM, 1972-1985.
Delaware Valley Regional Planning Commission, Philadelphia, Pa.
(1972). 92 p, 35 tab, 14 fig.

Descriptors: *Comprehensive planning, *Delaware River, Management, Water sources, *Water pollution control, *Water supply, Water pollution, Pennsylvania, New Jersey, Water policy, Waste treatment, Environmental effects, Sewage treatment, Water treatment, Regional development, Long-term planning.
Identifiers: *Delaware River Valley Region, Philadelphia(Pa.), Capital programming, *Regional planning.

The Regional Water Supply and Water Pollution Capital Program, adopted by the Delaware Valley Metropolitan Region in 1972 to accompany the regional plan, will guide development in the region by relating priorities, environmental impact, and available finances. Uniform methodology for analysis and standardization of construction costs were used to determine scheduling allocations. Time adjustments between county master plans and the regional plan were made. As of 1972, 391 capital development projects were proposed for the nine-county region, an expenditure exceeding 1.2 billion dollars. Geographically, 148 projects are scheduled for New Jersey and 243 for Pennsylvania, at costs of 292 million and 930 million dollars, respectively. Twenty-three sewage treatment plants are proposed, with expansion of 46 others. Approximately 73% of pollution control expenditures in New Jersey and 92% in Pennsylvania are scheduled before 1978. In water supply expenditures, 1972-1977 accounts for 66% of New Jersey expenditures and 83% for Pennsylvania. Federal funding can now represent 75% of sewage facility costs, and a federal Environmental Financing Authority helps local and state governments raise money for their share of costs. With increased federal participation, proposed regional development looks promising. (Grden-North Carolina)
W74-05877

MANAGEMENT OF STORM DRAINAGE AND FLOOD CONTROL ACTIVITIES.
Denver Regional Council of Governments, Colo.
Available from the National Technical Information Service as PB-224 110; $4.00 in paper copy, $1.45 in microfiche. Project REUSE, Final Report (Supplement). August, 1972. 38 p, 2 tab, 6 fig. HUD COLO-USE-1. DHUD-H-1392.

Descriptors: *Storm drains, *Urban drainage, *Management, *Project planning, *Drainage systems, *Flood control, Groundwater, Comprehensive planning, *Colorado, Multiple-purpose projects, Water quality, Water pollution, Drainage water.
Identifiers: Project REUSE, Systems management, *Denver(Colorado), Systems approach.

Drainage and flood control management approaches are not consistent within the Denver, Colorado, region and are fragmented and crisis-oriented in scope. Responsibilities of drainage management require coordinated efforts of the elective, planning, and technical levels. The systems approach differentiates the technical, management, political, and economic aspects of complex systems. Governing officials establish goals and objectives, and planning management must develop alternative conceptual designs of drainage systems to meet objectives. Criteria for decision making, an important part of the systems approach, are supplemented by priorities based on available resources. Implementation of the plan requires an implementing agency which can also perform technical functions. Coordination among levels is essential to identify and resolve new issues and to discharge functional responsibilities. Drainage systems management includes describing the current system status and defining problems correctly. Considerations include defining physical elements, describing the functional processes, identifying limiting resources, and identifying undesirable functional interactions. Continuous informational interchange is needed, especially with multi-jurisdictional projects and to foreseee how decisions will impinge on other systems areas. (Grden-North Carolina)
W74-05878

PLANNING MANUAL FOR STORM DRAINAG AND FLOOD CONTROL.
Denver Regional Council of Governments, Colo.
Available from the National Technical Inform tion Service as PB-224 109; $8.25 in paper cop $1.45 in microfiche. Project REUSE - Final Repo (Supplement), August, 1972. 139 p, 23 tab, 26 fi append. HUD COLO-USE-1. DHUD-H-1392.

Descriptors: *Systems analysis, *Managemen *Flood control, *Storm drains, Floods, Storm r noff, Urban drainage, *Colorado, Water polic River basins, River basin development, Runof Comprehensive planning, Drainage, Drainag systems, Drainage practices, Drainage wate Drainage basins, Drainage area, City planni Pollution.
Identifiers: Project REUSE, *Denver(Colorado Systems approach, Master planning, Maj drainage.

Systems engineering methodology used for maj drainage planning in Denver, Colorado, presented. Systems to satisfy specific user nee by modifying an existing system or by designing new one proceed through eight steps, includin defining the problem, gathering data, describin the system, defining objectives, developing model, describing alternatives, analyzing outpu and implementing decisions. Major drainag defined as presently unwanted flows of flood storm runoff resulting from natural events an managed in the fluid state, has systems charac teristics. The eight functions provide a base f analysis and development of short- and long-rang programs of drainage systems. Methodology pr vides technology, procedures, and standards f designing master plans. Systems approaches ar necessary for clear problem definition, an essen tial for finding maximum functional capability a minimum cost. Methodology is applied to the r gion by dividing it into ten planning basins, wit subbasins used to determine applicable drainag action. Mathematical models to relate aspects o drainage analysis and design are included. (Grden North Carolina)
W74-05879

LIQUID AERATION METHOD AND AP PARATUS.
S. M. Candel.
U.S. Patent No. 3,768,788, 7 p, 8 fig, 6 ref: Officia Gazette of the United States Patent Office. Vo 915, No 5, p 1749, October 30, 1973.

Descriptors: *Patents, *Sewage treatment *Aeration, *Oxygenation, Equipment, *Liqui wastes, *Waste water treatment, Pollution abate ment, Water quality control, Water pollution con trol.

Aeration of sewage is achieved by arrangin several diffusing surfaces in an optimum patter around the tank and transmitting an identical quan tity of air through each diffusing surface so tha several columns of air bubbles rise to the surface This maximizes the rate of air/liquid interfac production by increasing the mean velocity dif ference between air and liquid, and enhancing th degree of localized microturbulence. The re sidence time of the air bubbles is also increase and oxygenation is more efficient. (Sinha-OEIS)
W74-05883

DISPERSED GROWTH BIOLOGICAL SEWAGE TREATMENT PROCESS.
Oklahoma State Univ., Stillwater. (assignee)
D. F. Kincannon, A. Macuila, and W. G. Tiederman, Jr.
U.S. Patent No 3,769,204, 2 p, 1 fig, 4 ref: Official Gazette of the United States Patent Office, Vol 915, No 5, p 1843, October 30, 1973.

Descriptors: *Patents, *Sewage treatment, *Organic wastes, Metabolism, *Oxidation, *Biological treatment, *Waste water treatment.

Identifiers: Hydrocyclonic, *Secondary treatment.

A dispersed growth biological secondary sewage treatment process for removing dissolved organic material and suspended organic material from sewage conprises of the following steps: metabolize the dispersed biological solids to yield new cell material, carbon dioxide and water; subject the metabolized medium to hydrocyclonic forces to separate it into clean effluent and concentrated biological solids; and totally oxidize the concentrated biological solids in a saturation environment. The oxidation tank provides a starvation environment for the biological cells so that they will digest themselves. Air is injected into the tank and the new cell growth results in the production of water and carbon dioxide. The outflow is then injected by pump into the hydroclone concentrator. The outflow from the contrator is recycled until clear effluent is discharged as a nonpollutant. (Sinha - OEIS)
W74-05884

APPARATUS AND METHOD FOR REMOVING SOLIDS FROM LIQUIDS,
Rockwell International Corp., El Segundo, Calif. (assignee)
L. R. McCoy.
U.S. Patent No. 3,770,605, 6 p, 9 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 916, No 1, p 246, November 6, 1973.

Descriptors: *Patents, Electric fields, *Electrodes, *Waste water treatment, Equipment, *Pollution abatement, Solid wastes, Liquid wastes.
Identifiers: Hydrocyclonic, *Secondary treatment.

An apparatus and method are described for enhancing the effects of electrical fields in achieving the removal of finely divided solids from liquids. The apparatus includes an electrical cell structure consisting of at least two electrodes one of which is insulated, means to supply interrupted direct current or low frequency alternating current to the electrodes, and means to pass liquid contaminated with solid particles between the electrodes. A surface for collecting solids may also be interposed between the electrodes. (Sinha-OEIS)
W74-05885

WASTE TREATMENT APPARATUS,
Fairchild Industries, Inc., Germantown, Md. (assignee)
H. D. Freudenthal, R. E. Townsend, P. K. Zawoiski, and E. Schatz.
U.S. Patent No. 3,779,911, 12 p, 7 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 917, No 3, p 1087, December 18, 1973.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Equipment, *Microorganisms, *Aeration, Pollution abatement, Water quality control, Water pollution control, Hydrogen ion concentration.

A rotatable waste treatment drum is inclined in a stationary frame so that the waste sewage will flow from the inlet toward the outlet under the influence of gravity while being exposed to separate treatment stages in batches, separated within the drum by a helical member. The helical member is connected to the interior wall of the drum and to an axial hollow core and forms a plurality of variably spaced convolutions that are formed about the axial hollow core. As the drum rotates the batches of waste sewage disposed in the lower segment of the drum between the convolutions of the helical member are successively raised to a high level as the drum is rotated and the waste is undergoing treatment. Clarified liquid effluent is removed during the treatment cycle through the hollow core and part of the treated liquid effluent containing active microorganisms is introduced to the untreated waste entering the inlet end of the drum. Rotation of the drum and selective aeration of the waste sewage is controlled by a system associated with the drum. The control system has chemical sensing and dispensing apparatus that sense the chemical concentrations or pH of the wastes being treated and add chemicals to the wastes when needed. (Sinha-OEIS)
W74-05889

WATER CLARIFICATION PROCESS USING SILICON-CONTAINING AMINOMETHYL PHOSPHONATES,
Petrolite Corp., Wilmington, Del. (assignee)
D. Redmore, and F. T. Welge.
U.S. Patent No. 3,779,912, 10 p, 2 tab, 1 ref; Official Gazette of the United States Patent Office, Vol 917, No 3, p 1088, December 18, 1973.

Descriptors: *Patents, Water treatment, *Corrosion control, *Waste water treatment.
Identifiers: *Water clarification, *Chemical treatment, Phosphonates, Silicon, Alkyleneamino, *Scale inhibitors.

The silicon atom is silicone functional (i.e., has a -SiO-group) and is also attached to an alkyleneamino group which may have one or more amino groups (i.e., an alkylene-amin group having at least one N-H group) capable of reacting with a carbonyl compound (i.e., aldehyde or ketone) and phosphorous acid, or a derivative thereof, to form aminomethyl phosphonic acid. All, or less than all, of the N-H groups may be converted to aminomethyl phosphonic acids. The silicon-aminomethyl phosphonic acids may be monomeric, polymeric, or copolymeric. They are useful, for example, as corrosion inhibitors, scale inhibitors, water clarifiers and for other uses. (Sinha-OEIS)
W74-05890

WATER TREATMENT,
W. C. Martin.
U.S. Patent No. 3,779,913, 5 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 917, No 3, p 1088, December 18, 1973.

Descriptors: *Patents, *Waste water treatment, *Oxidation, Bubbles, Pollution abatement, Water pollution control, Water quality control, Equipment, *Aeration.
Identifiers: Compression, *Pressure vessels.

The method of treating water in a pressure vessel comprises the following steps: filling the vessel with a predetermined amount of air; adding a predetermined amount of water to the vessel, thereby compressing the air; recirculating the air from the top of the vessel and bubbling it through the water, thus inter-contacting the air and the water for a predetermined time, then venting the air, and draining the treated water. (Sinha-OEIS)
W74-05891

WATER RECLAMATION-ALGAE PRODUCTION,
Era, Inc., Clovis, N. Mex. (assignee)
J. E. Ort.
U.S. Patent No. 3,780,471, 7 p, 2 fig, 1 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 917, No 4, p 1224, December 25, 1973.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, Suspended solids, Bacteria, Virus, Organic wastes, Phosphates, Nitrogen, *Algae, *Aerobic treatment, *Anaerobic conditions, *Reclamation, Water quality control, Water pollution control, Ponds.
Identifiers: Decarbonation.

Wastewater is treated in a manner which greatly reduces the level of organic waste matter, phosphates, fixed nitrogen, bacteria, virus and suspended solids. Water is reclaimed and an algae by-product is recovered by employing a series of three ponds with different depths and detention periods, each of which performs specific functions. A dissolved-air-lime flotation step is then used to separate suspended materials (primarily algae). After the flotation step the water is held at a high pH to achieve total disinfection prior to recarbonation to stabilize the water. The by-product algae material is refined by centrifugal separation of calcium carbonate from the slurry or, optionally, by alkaline hydrolysis of protein from the algae followed by acid precipitation to yield a high quality protein concentrate. One pond performs the anaerobic function, another the decarbonation function and an intermediate pond performs the aerobic function. (Sinha-OEIS)
W74-05892

WATER PURIFICATION APPARATUS AND CARTRIDGE THEREFOR,
H. N. Industries, Inc., New Haven, Conn. (assignee)
For primary bibliographic entry see Field 5F.
W74-05895

AEROBIC SEWAGE TREATMENT,
Bertran and Hargraves, Inc., Tampa, Fla. (assignee)
W. J. Hargraves.
U.S. Patent No. 3,780,997, 4 p, 10 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 917, No 4, p 1362, December 25, 1973.

Descriptors: *Patents, *Aerobic treatment, Organic wastes, Pollution abatement, *Bubbles, *Liquid wastes, *Waste water treatment, *Sewage treatment, Equipment.
Identifiers: Biochemical digestion.

Contact between a gas stream and a mass of liquid sewage is achieved by use of several open ended inclined air-lift pipes immersed one above another in the liquid sewage. A stream of gas bubbles is introduced into the lowermost pipe whereby liquid is entrained therein. The upper end of each pipe, except the uppermost pipe, is disposed in a position below the lower end of the next higher pipe so that air bubbles issuing from the upper end of a lower pipe cause the liquid entrained therewith to be forced outwardly into the mass of liquid sewage. Gas bubbles subsequently enter the lower end of the next higher pipe and entrain new liquid sewage from the mass of liquid. (Sinha-OEIS)
W74-05896

WASTE TREATMENT SYSTEM,
Dayton Mfg. Co., Ohio. (assignee)
V. Materese.
U.S. Patent No. 3,782,550, 6 p, 13 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 918, No 1, p 279, January 1, 1974.

Descriptors: *Patents, *Waste water treatment, Slurries, *Filtration, Pollution abatement, Equipment, Water pollution control, Water quality control, Separation techniques.
Identifiers: *Chemical treatment.

The solids are separated from the liquids in a two stage operation. In one embodiment of the invention a series of settling chambers are utilized for the initial separation, while in a second embodiment screens having openings of decreasing size in the downstream direction are utilized. Both systems thereafter utilize a cylindrical filter to provide final separation of the solids from the liquids. The resulting liquid effluent passes from the filter into a mixing section of the treatment tank where it is mixed with an additive to render it pathogenically harmless and is thereafter discharged from the system when displaced by an incoming charge of sewage slurry. (Sinha-OEIS)
W74-05898

DECANTING CENTRIFUGE FOR DRAINING OFF WATER FROM SEWAGE SLUDGE,
Kruger (I.) A/S, Copenhagen (Denmark). (assignee)
J. Bye-Jorgensen, and G. H. Larsen.
U.S. Patent No. 3,782,623, 3 p, 2 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 918, No 1, p 298, January 1, 1974.

Descriptors: *Patents, *Sewage treatment, *Centrifugation, *Waste water treatment, *Sewage sludge, Pollution abatement, Water pollution control, Water quality control, Equipment.
Identifiers: Centrifuges.

The decanting centrifuge for draining off water from sewage sludge has a rotating bowl and helical walls rotating in it to scrape the sludge towards the end of the bowl to discard it. The rotating bowl has a small diameter in the region where the introduction takes place, to restrict the free drop of the sludge to a small distance, and at the same time providing a smooth passage, such as a conus, from the narrow part of the bowl to the wider part. This is important to secure a gradual increase of velocity and to reduce any tendency to create turbulence. (Sinha-OEIS)
W74-05899

PROCESS FOR RECOVERING FOREST PRODUCT PLANT WASTES,
R. E. S. Thompson.
U.S. Patent No. 3,783,128, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 918, No 1, p 418, January 1, 1974.

Descriptors: *Patents, Bark, *Wood wastes, Sawdust, *Pulp wastes, *Activated carbon, Pollution abatement, *Filtration, *Waste water treatment, Pulp and paper industry.
Identifiers: Mill wastes, Forest products.

Solid cellulosic waste can be carbonized and, in a second stage, the charcoal produced can be formed into activated carbon. The activated carbon is then used as a filtration medium for liquid cellulosic waste which, when it becomes loaded, is recycled to the carbonizing step. The carbon and entrained solids are returned to one of the furnaces. Off-gas from all furnaces is passed to a boiler for steam generation; the spent gas is passed through an absorber, if necessary, before release. (Sinha-OEIS)
W74-05900

WASTE AND WATER TREATMENT SYSTEM,
Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).
A. B. Turner.
U.S. Patent No. 3,784,014, 5 p, 2 fig, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 918, No 2, p 680, January 8, 1974.

Descriptors: *Patents, *Waste water treatment, Equipment, *Filtration, *Suspended solids, Activated carbon, Dissolved solids, *Electrophoresis, Separation techniques, Pollution abatement, Water pollution control, Water quality control.
Identifiers: Electrophoretic coalescene.

A minimum size, maximum effluent quality treatment apparatus is obtained by sizing the surge conditioning for minimim volume and the filtration system for maximum flow and performance. The filtration-absorption system includes at least one column of a bimetallic media. The particles of filter media having differing electrode potentials produce a galvanic cell and attract ionized particles in the throughput solution. Several columns may make up the filtration system. In one example, the media in the first column is 20 to 50 mesh aluminum powder. This filter medium performs a dual function. First it removes the conditioned suspended solids remaining in the liquid after the gross solids separation step performed by a coiled spring conveyor separator, and second it adds coagulating ions to the remaining liquid by corrosion of the aluminum powder. These aluminum ions precipitate and coagulate any suspended material and some of the dissolved material remaining in the liquid. After passing through this first column, the liquid goes to a stripper column. The stripper operation is based on the principle of electrophoretic coalescence. The stripper column may be filled with a mixture of aluminim powder and granular carbon which react to form a galvanic cell and attract the ions remaining in solution. The third column is filled with activated carbon. (Sinha-OEIS)
W74-05905

LIQUID TREATMENT PLANT AND PROCESS, PARTICULARLY FOR WASTE WATER,
Canadair Ltd., Montreal (Quebec).
J. E. Chatfield.
U.S. Patent No. 3,779,910, 4 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 917, No 3, p 1087, December 18, 1973.

Descriptors: *Patents, *Liquid wastes, *Waste water treatment, *Treatment facilities, Equipment, *Water purification, *Flocculation, Pollution abatement, Water quality control, Water pollution control.
Identifiers: Coagulants.

A process comprises serially flowing liquid containing impurities under gravity at predetermined relative velocities through several stages. A chemical coagulant is fed to the waste water influent and stirred to counter the normal flow to achieve extended residence time and reduce throughflow velocity of the waste water mixture through the mixing stage. The waste water mixture is then funneled to the bottom portion of the flocculation chamber. The mixture is raised through one field of suspended particles, recirculating deposited sludge into the flocculation chamber to enhance flocculation. Then by pumping deposited sludge into the flocculation chamber the sludge settles to produce supernatant. The sludge supernatant flows into the flocculation chamber and tumbles the waste water mixture, raises the mixture through another field of suspended particles, passes the mixture through curtains of falling floc and between sedimentation trays for deposition of the sludge and the formation of a clarified waste water mixture. The latter is chemically treated to obtain satisfactory flocculation and sludge deposition conditions in order to produce a purified waste water effluent which is allowed to overflow. (Sinha-OEIS)
W74-05906

METHOD AND APPARATUS FOR MIXING GASES WITH WATER,
Water Treatment Corp., City of Industry, Calif. (Assignee).
For primary bibliographic entry see Field 5F.
W74-05907

ATP POOLS IN ACTIVATED SLUDGE,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
S. Y. Chiu, I. C. Kao, L. E. Erickson, and L. T. Fan.
Journal Water Pollution Control Federation, Vol 45, No 8, p 1746-1758, August 1973. 18 fig, 4 tab, 30 ref. OWRR A-045-KAN(3) 14-31-0001-3516.

Descriptors: *Activated sludge, *Waste dilution, *Waste water treatment, Waste identification, Biological treatment, Sludge treatment.
Identifiers: *Process identification, *Adenosine triphosphate, Process control.

The possibility of using adenosine triphosphate (ATP) in process identification and control is investigated. Its suitability according to fixed criteria is discussed and other methods evaluated. Results of experiments indicate that dilution rat can affect sludge activity and cellular ATP conten significantly and that ATP concentrations in ex periments with both continuous and batch culture were generally proportional to the biomass and t the amount of substrate removed. Because ATI concentration responds rapidly to cell viability an changes with population shifts and the phase o growth, it is concluded that ATP may be a usefu variable in process identification, operation, an control, although further understanding of th relationship between ATP concentration and ac tivated sludge behavior is necessary if its ful potential as a measurable variable is to be realized
W74-05914

OPTIMAL PLANNING FOR A THERMAI DISCHARGE TREATMENT SYSTEM,
California Univ., Los Angeles. Dept. of Engineer ing Systems.
J. A. Dracup, and T. J. Fogarty.
Water Resources Research, Vol 10, No 1, p 67-71 February 1974. 2 tab, 7 ref.

Descriptors: *Water pollution control, *Therma pollution, *Treatment facilities, Planning, Rive basins, Methodology, *Dynamic programming *Simulation analysis, *By-pass piping, Tempera ture, Economics, Nuclear powerplants, Con straints, Equations, Reach(Streams), System analysis, Mathematical models, Optimal develop ment plans.
Identifiers: *Cost minimization.

The characteristics and economic implications o thermal pollution are considered within the con text of the planning of a treatment system for a se ries of hypothetical nuclear power plants that ar to be located adjacent to a river. The problem is t determine the optimal planning of a treatmen system. The objective of the planning procedure i to minimize the total annual cost for the construc tion and operation of the entire system, subject t a maximum temperature requirement within eacl reach or section of the river. The problem is solve by considering the effect that a bypass-pipin system has on temperatures within the river. Th technique of bypass piping consists of pipin wastewater downstream to reaches of a rive where the regenerative powers of the physica system have reduced the level of pollution to th extent that more waste water may be disposed. B noting that the bypass-piping system allows th beginning and end temperatures of a section of th river to be controlled, a procedure can b developed for separating the optimization mode of the entire system. This model is separated into set of small subproblems that are solved by simu lation and a system problem that is solved b dynamic programming. Results show that th bypass-piping system significantly reduced th cost of the entire treatment system. (Bell-Cornell)
W74-05933

BIOLOGICAL TREATMENT OF WATER USEI IN POTATO CHIP MANUFACTURE, WITH YEASTS, (IN FRENCH),
Laval Univ., Quebec. Departement des Vivres.
R. E. Simard, G. Busque, and R. R. Riel.
Can Inst Food Sci Technol J. Vol 6, No 1, p 32-36 1973. Illus. English summary.
Identifiers: *Biological treatment, *Waste wate treatment, Fodder, *Potato wastes, Rhodotorula glutinis, *Yeasts, *Industrial wastes.

Potato chip waste water was submitted to biologi cal treatment by yeasts and a strain of Rhodotoru la glutinis gave the highest reduction efficiency i pollutants. The following reducations were ob tained: 96.1% for phosphates, 85.2% fo COD(chemical oxygen demand), 79.5% for am moniacal N and 57.1% for total N in the waste water. The sludge contains 53.1% of protein anc can be used as fodder.--Copyright 1973, Biologica Abstracts, Inc.
W74-05944

5E. Ultimate Disposal Of Wastes

SURVEY OF WASTEWATER FACILITIES AND RECEIVING WATERS AND PROPOSED PERFORMANCE SPECIFICATIONS, MCGUIRE AFB AND FT DIX, NEW JERSEY, VOLUMES I AND II,
Environmental Health Lab., Kelly AFB, Tex.
For primary bibliographic entry see Field 5D.
W74-05530

GROUNDWATER RECHARGE WITH TREATED WASTEWATER,
Wisconsin State Univ., Oshkosh. Dept. of Geology.
For primary bibliographic entry see Field 5D.
W74-05552

SOIL STORAGE LIMITATIONS ON EFFLUENT IRRIGATION,
Missouri Univ., Columbia. Dept. of Forestry.
For primary bibliographic entry see Field 5D.
W74-05676

HIGHLIGHTS OF THE FEDERAL WATER POLLUTION CONTROL ACT OF 1972,
Morgan, Lewis and Bockius, Washington, D.C.
C. W. Smith.
Dickinson Law Review, Vol 77, No 3, p 459-491, Spring 1973. 121 ref.

Descriptors: *Legislation, *Water law, *Pollution control, *Permits, *Standards, Water quality, Water quality control, Waste discharge, Waste disposal, Industrial wastes, Pollutants, Pollution effects, Federal government, Administrative agencies, Jurisdiction, Effluents, State governments, Long-term planning, Navigable waters, Rivers, Lakes, Streams, Oceans, Water development.

The Federal Water Pollution Control Act of 1972 authorizes the Environmental Protection Agency (EPA) to deal with water pollution throughout the United States. The effect to industrial dischargers of effluents is described. The Act is two-pronged in that it imposes effluent limitations as well as water quality standards. The effluent discharge limitations on the discharge of pollutants will be enforced primarily by the issuance of a permit to discharge, contingent upon the situs state of the discharge certifying that the discharge complies with the Act. Federal jurisdiction extends to all navigable waters and emanates as well from the 'general welfare' clause in the Constitution. Discharge limitations focus upon the technology used at the source of the pollution to control and reduce it. Water quality standards deal generally with the results to be achieved. Industry is no longer provided with a license to pollute, but in fact must use all the technological developments at its disposal to develop sound pollution-free discharge systems by the target dates provided. The Act also extends to oil spills and ocean dumping as well as inland waterways. (Silber-Florida)
W74-05780

NORFOLK HARBOR DISPOSAL STUDY: HYDROGEOLOGIC STUDY OF NANSEMOND CITY DISPOSAL AREA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 5B.
W74-05847

5F. Water Treatment and Quality Alteration

WATER SUPPLY OF THE POPULATION AS A SOCIAL FACTOR IN THE PREVENTION OF INTESTINAL INFECTIONS, (IN RUSSIAN),
D. P. Nikitin.
Gigiena Sanitariya, Vol 37, No 10, p 54-56, 1972.

Identifiers: Human population, *Intestinal infections, *USSR, *Water supply, *Public health, *Disease prevention, *Conduits, Conveyance structures.

The 5-yr development plan of the Soviet economy provides for improving public welfare in populated centers, particularly the construction of water lines. These major social undertakings will help to eliminate the transmission of intestinal infections through water supplies.--Copyright 1973, Biological Abstracts, Inc.
W74-05456

PROCEEDINGS OF THIRD SANITARY ENGINEERING CONFERENCE, DISINFECTION AND CHEMICAL OXIDATION IN WATER AND WASTE TREATMENT.
Available from Univ of Illinois, Office of Publication, 49 Administration Bldg (West), Urbana, Ill Price $2.00. Conference conducted by Illinois Dept of Public Health and Univ of Illinois, Jan 31 and Feb 1, 1961, Urbana: University of Illinois Bulletin, Vol 59, No 46, January 1962. 62p.

Descriptors: *Water treatment, *Public health, *Disinfection, *Oxidation, Sanitary engineering, Water quality, *Waste water treatment.
Identifiers: *Iodination, Silver sterilization, Quaternary ammonium compounds.

Seven papers pertinent to disinfection and oxidation procedures in water supplies are presented. Titles are: Chlorine: Its Development; Characteristics and Utility for Disinfection and Oxidation; Feeding, Handling and Storage of Chlorine; The Germicidal Efficiency of Silver, Iodine, and Quaternary Ammonium Compounds; Analytical Procedures for the Control of Disinfectants in Water Treatment; Disinfection and Oxidation of Domestic Wastes; Disinfection and Oxidation of Industrial Wastes; and Auxiliary Uses of Disinfection and Oxidizing Agents in Water Treatment. (See also W74-05508 thru W74-05514) (Bean-AWWARF)
W74-05507

CHLORINE: ITS DEVELOPMENT, CHARACTERISTICS AND UTILITY FOR DISINFECTION AND OXIDATION,
Chlorine Inst., New York.
E. J. Laubusch.
In: Third Sanitary Engineering Conference on Disinfection and Chemical Oxidation in Water and Waste Treatment, conducted by Illinois Dept of Public Health and Univ of Illinois, Jan 31-Feb 1, 1961, Urbana: Univ of Illinois Bulletin, Vol 59, No 46, p 6-17, January 1962. 11 fig, 2 tab, 12 ref.

Descriptors: *Chlorination, *Chlorine, *Reviews, Disinfection, Waste water treatment, *Water treatment, Sanitary engineering.

The utility of chlorine in water treatment is attributable to its toxicological characteristics and its strong oxidation capacity. Chlorine is employed either to destroy or control bacteria, or to modify the chemical character of the water, or for both purposes. Not all chlorine forms are equally efficacious for all purposes. Although chlorine as a chemical oxidant has considerable utility in water treatment, by far its most important use is for disinfection, and for nuisance and other organism control. Combined chlorine forms, principally inorganic chloramines, are effective for disinfection providing the concentration and exposure time are adequate. (See also W74-05507) (Knapp-USGS)
W74-05508

FEEDING, HANDLING AND STORAGE OF CHLORINE,
Fischer and Porter Co., Maywood, Ill. Midwest Region.
R. D. Mann.
In: Third Sanitary Engineering Conference on Disinfection and Chemical Oxidation in Water and Waste Treatment, conducted by Illinois Dept of Public Health and Univ of Illinois, Jan 31-Feb 1, 1961, Urbana: Univ of Illinois Bulletin, Vol 59, No 46, p 18-28, January 1962. 8 fig.

Descriptors: *Chlorination, *Chlorine, *Reviews, Disinfection, Waste water treatment, *Water treatment, Sanitary engineering.

The proper facilities and operating procedures for storage, handling, and feeding of chlorine should never be thought of as being so commonplace that there is no need for either improvement or periodic training. Proper chlorination should begin with building facilities designed for maximum covenience compatible with maximum safety. Chlorine containers and the chlorine feeding equipment should be stored in rooms with no other equipment present. Although the cost of chlorination is a small percentage of the total plant cost, its contribution to the overall processing is extremely important from the public safety standpoint. Because of the virtual necessity of chlorination it is extremely important to: know the process both in its advantages and limitations; train personnel in safety procedures and proper maintenance of equipment; have the proper physical facilities for storing, handling, and feeding chlorine; and, finally, make a careful analysis of system requirements for special storage, handling, and feeding control to get maximum value for money spent. (See also W74-05507) (Knapp-USGS)
W74-05509

THE GERMICIDAL EFFICIENCY OF SILVER, IODINE AND QUATERNARY AMMONIUM COMPOUNDS,
Public Health Service, Cincinnati, Ohio. Div. of Water Supply and Pollution Control.
C. W. Chambers.
In: Third Sanitary Engineering Conference on Disinfection and Chemical Oxidation in Water and Waste Treatment, conducted by Illinois Dept of Public Health and Univ of Illinois, Jan 31-Feb 1, 1961, Urbana: Univ of Illinois Bulletin, Vol 59, No 46, p 29-42, January 1962. 3 fig, 6 tab, 34 ref.

Descriptors: *Disinfection, *Water treatment, *Waste water treatment, Bromine, Iodine, Silver, Ammonia, Sanitary engineering.

Silver, quaternary ammonium compounds, iodine, chlorine dioxide, bromine, and ultraviolet light are discussed as germicides for water treatment. The cost of using UV is difficult to relate to the price of chlorine, but the cost of current alone would be many times that of sufficient chlorine to do the same job. Chlorine dioxide is unstable, extremely corrosive, and a definite explosion hazard. Some of the advantages of using bromine are: it is easier to feed and not as hazardous to store as chlorine; the bactericidal efficiency of bromamines formed in swimming pools is much greater than that of chloramines; apparent freedom from complaints of eye irritation; and odors are not troublesome. Liquid bromine costs approximately 3.5 times as much as chlorine. Because of objectionable flavors and toxic effects quaternary ammonium compounds have not been seriously considered for use in drinking water. The Food and Drug Administration does not permit their use in milk and food products. They have been suggested for use to control algae in swimming pools. Another use for which they have been advocated is prevention of growths in cooling system water. The application of silver is limited to situations where cost is not a primary consideration. While some reduction in dosage with iodine might be considered because of probable increased persistence of the germicidal residual, the economics are strongly against the use of iodine as a substitute for chlorine except under circumstances where cost is a secondary consideration. (See also W74-05507) (Knapp-USGS)
W74-05510

ANALYTICAL PROCEDURES FOR THE CONTROL OF DISINFECTANTS IN WATER TREATMENT,
Georgia Inst. of Tech., Atlanta. School of Applied Biology.
R. S. Ingols.
In: Third Sanitary Engineering Conference on Disinfection and Chemical Oxidation in Water and Waste Treatment, conducted by Illinois Dept of Public Health and Univ of Illinois, Jan 31-Feb 1, 1961, Urbana: Univ of Illinois Bulletin, Vol 59, No 46, p 42-47, January 1962. 1 fig, 4 ref.

Descriptors: *Disinfection, *Chlorination, *Analytical techniques, Laboratory tests, Chlorine, Sanitary engineering, *Water treatment.

The quantity and quality of disinfectants used in water can be controlled by various analytical procedures. Simple test can be used readily by nonprofessional personnel for routine plant operation; complex procedures for more limited use by professionally trained people can provide information about the intensity of the possible disinfecting reactions as well as the quantity of the compounds present. These test are briefly reviewed. (See also W74-05507) (Knapp-USGS)
W74-05511

DISINFECTION AND OXIDATION OF DOMESTIC WASTES,
North Shore Sanitary District, Waukegan, Ill.
For primary bibliographic entry see Field 5D.
W74-05512

DISINFECTION AND OXIDATION OF INDUSTRIAL WASTES,
Industrial Waste Control, Flint, Mich. Buick Motor Div.
For primary bibliographic entry see Field 5D.
W74-05513

AUXILIARY USES OF DISINFECTION OXIDIZING AGENTS IN WATER TREATMENT,
American Water Works Service Co., Inc., Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W74-05514

HEALTH-MUNICIPAL WATER TREATMENT PLANTS.
For primary bibliographic entry see Field 6E.
W74-05773

WATER PURIFICATION APPARATUS AND CARTRIDGE THEREFOR,
H. N. Industries, Inc., New Haven, Conn. (assignee)
J. V. Zirlis.
U.S. Patent No. 3,780,867, 4 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 917, No 4, p 1327, December 25, 1973.

Descriptors: *Patents, *Activated charcoal, *Water purification, Diatomaceous earth, *Filtration, *Water treatment, Potable water, *Waste water treatment.

The water purification apparatus includes an elongated housing having a water inlet port and a water outlet port. A cartridge comprising an elongated casing is adapted for flow of water from the outside to the interior and then out one end for exit through the outlet port of the housing. The casing of the cartridge contains an activated charcoal medium as one water treatment stage. Surrounding the casing are two superposed sleeves comprising mesh of a gauge effective to retain coarse particulate matter in water flowing therethrough. A diatomaceous earth layer between the two stages defines another water treatment stage. (Sinha-OEIS)
W74-05895

OZONATING APPARATUS FOR DRINKING WATER,
Moody Aquamatic Systems, Inc., Meadville, Pa. (Assignee).
V. R. Troglione.
U.S. Patent No. 3, 784,008, 7p, 9 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 918, No 2, p 678, January 8, 1974.

Descriptors: *Patents, *Water purification, *Ozone, Bacteria, Pollutants, *Odor, *Taste, Water quality control, *Potable water, *Water treatment.

Drinking water is purified by automatically supplying ozone gas to remove undesirable bacteria, contaminants and/or undesirable odors or tastes from the water. With this apparatus ozone gas is automatically applied to contaminated water in a contact tank, and is then transferred to a discharge tank in such manner that contaminated water cannot accidentally pass from one to the other tank, when the system is on automatic operation. Electrical controls responsive to sensing means disposed exteriorly of the contact tank, and responsive to predetermined changes in the weight or level of the water in the contact tank, automatically replenish the supply of ozonated water in the discharge tank, when necessary. (Sinha-OEIS)
W74-05904

METHOD AND APPARATUS FOR MIXING GASES WITH WATER,
Water Treatment Corp., City of Industry, Calif. (Assignee).
S. W. Beitzel, and R. F. Edwards.
U.S. Patent No. 3,775,314, 4 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 916, No 4, p 1493, November 27, 1973.

Descriptors: *Patents, *Oxygenation, *Ozone, *Water purification, Water quality control, Equipment, *Water treatment, Clathrates.

Water is purified by increasing the concentration and retention time of ozone and/or oxygen in water. The cyclonic mixing apparatus used consists of a hollow housing having an end wall; a cylindrical shaped wall attached to the end wall and defining a liquid receiving space. An inverted frustrum shaped wall is attached to the cylindrical wall opposite to the end wall. A liquid accelerating space is joined with a liquid receiving space. A whirling mass of fluid is injected into the body of water to be purified. In the body of water there is created a partial vacuum zone containing water and water vapor. Oxygen and/or ozone gas is introduced at a pressure of less than about 15 psi forming bubbles. As water vapor forms and cools water vapor condenses on the surface of the bubbles to form a clathrate molecule thus increasing the retention time of ozone and oxygen. (Sinha-OEIS)
W74-05907

5G. Water Quality Control

NITROGEN UPTAKE EFFICIENCY BY FOUR PLANT SPECIES IN THE FIELD AND GROWTH CHAMBER,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W74-05404

AN INVESTIGATION OF THE EFFECTS OF DDT AND OTHER CHLORINATED HYDROCARBONS ON THE GROWTH OF EURYHALINE MICROALGAE,
Maine Univ., Orono. Dept. of Botany; Maine Univ., Orono. Dept. of Oceanography; and Maine Univ., Orono. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-05407

INVESTIGATION OF POROUS PAVEMENTS FOR URBAN RUNOFF CONTROL,
Franklin Inst. Research Labs., Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W74-05411

SUBSURFACE ASPHALT MOISTURE BARRIERS IN SANDY SOILS,
Delaware Univ., Newark. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W74-05412

MASS TRANSFER IN HETEROGENEOUS SYSTEMS AND VELOCITY AND GAS ABSORPTION STUDIES FOR SINGLE BUBBLES,
Iowa State Univ., Ames. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W74-05413

CYPRETTA KAWATAI, A NEW SPECIES OF FRESHWATER OSTRACODA (CRUSTACEA),
Geological Survey, Washington, D.C.
I. G. Sohn, and L. S. Kornicker.
Proc Biol Soc Wash. Vol 85, No 26, p 313-316, 1972. Illus.
Identifiers: Biomphalara-glabrata, *Crustacea, Cypretta-kawatai, New species, *Ostracoda(Freshwater), Predator, *Schistosomiasis, Vectors, Water pollution control, *Snails(Vectors).

Cypretta kawatai is described on the basis of several hundred specimens, in all stages of growth, from aquaria in the Johns Hopkins University, Baltimore, Maryland. The habitat is presumed to be freshwater ponds and ditches in Belo Horizonte, Brazil. This species is an effective predator of Biomphalaria glabrata, a vector snail of the blood fluke that causes schistosomiasis.
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W74-05454

WATER SUPPLY OF THE POPULATION AS A SOCIAL FACTOR IN THE PREVENTION OF INTESTINAL INFECTIONS, (IN RUSSIAN),
For primary bibliographic entry see Field 5F.
W74-05456

WATER POLLUTION CONTROL IN ALASKA,
L. Laska.
Water Air Soil Pollut. Vol 1, No 4, p 415-432. 1972.
Identifiers: *Alaska, *Oil pollution, *Water pollution control, Legal aspects, *Water law, Jurisdiction.

An analysis of Alaskan water pollution laws and problems, especially oil pollution, is presented. Particular attention is given to statute law, jurisdiction, and procedures for applying the laws.
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W74-05465

ADSORPTION OF HG(II) BY HYDROUS MANGANESE OXIDES,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5A.
W74-05491

FEEDING, HANDLING AND STORAGE OF CHLORINE,
Fischer and Porter Co., Maywood, Ill. Midwest Region.
For primary bibliographic entry see Field 5F.
W74-05509

CONSERVATION OF WATER AND REDUCTION OF POLLUTION BY USE OF SOLVENT

SYSTEMS FOR COLORING TEXTILE MATERIALS: AN ECONOMIC OUTLOOK,
Auburn Univ., Ala. Dept. of Textile Engineering.
For primary bibliographic entry see Field 3E.
W74-05535

OIL IN SCOTTISH WATERS,
Office of Naval Research, London (England).
For primary bibliographic entry see Field 5B.
W74-05551

PRIMER ON AGRICULTURAL POLLUTION,
For primary bibliographic entry see Field 5B.
W74-05569

PART 124--STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION IN THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
40 C.F.R. Part 124 (1973). 22 p.

Descriptors: *Federal government, *Permits, *Pollutants, *Discharge, *Water quality control, Administrative agencies, *State governments, Interstate compacts, Navigable waters, Standards, Regulations, Water quality, Water policy, Pollution control, Pollution abatement, Waste disposal, Effluents, Chemical wastes, Biological wastes, Radioactive wastes, Legal aspects, Water law, Planning, Cooperation.

Guidelines are established that specify procedural and other elements which must be present in a state or interstate program in order to obtain approval of the Administrator of the Environmental Protection Agency (EPA) for participation in the National Pollution Discharge Elimination System (NPDES). Any state or interstate program participating in the NPDES must have a statute or regulation, enforceable in State courts, which prohibits discharges of pollutants by any person, except as authorized pursuant to an NPDES permit. Any state or interstate agency participating in the NPDES shall insure that no permits shall be issued authorizing any of the following discharges: radiological, biological or chemical warfare agents or high-level radioactive wastes into navigable waters; or any discharge determined by the Secretary of the Army that would substantially impair anchorage and navigation. Additionally, each permit granted shall state the effluent standards and limitations as well as the water quality standards which must be observed by a discharger. (Silber-Florida)
W74-05573

PROTECTION OF PUBLIC WATER SUPPLY.
For primary bibliographic entry see Field 6E.
W74-05574

EXPLORATION, PRODUCTION, OR TRANSPORTATION OF OIL OR GAS IN NAVIGABLE WATERS.
For primary bibliographic entry see Field 6E.
W74-05576

SIERRA CLUB V. LYNN (ACTION CHALLENGING EIS WHICH FOUND COMMUNITY PROJECT WOULD NOT POLLUTE WATER RESERVOIR).
For primary bibliographic entry see Field 6E.
W74-05577

RESCUING THE OCEANS, THE NEED FOR IMMEDIATE ACTION,
For primary bibliographic entry see Field 5C.
W74-05579

STRIP MINING: PARTNERSHIP IN GREED,
For primary bibliographic entry see Field 5C.
W74-05582

NEPA IN THE COURTS: A LEGAL ANALYSIS OF THE NATIONAL ENVIRONMENTAL POLICY ACT,
Environmental Law Inst., Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-05586

LEGISLATIVE FRAMEWORK FOR WATER RESOURCES MANAGEMENT IN ALABAMA.
Alabama Univ., University. Natural Resources Center.
For primary bibliographic entry see Field 6E.
W74-05590

WASTE DISPOSAL.
For primary bibliographic entry see Field 6E.
W74-05594

WATER POLLUTION--WASTE DISPOSAL.
For primary bibliographic entry see Field 6E.
W74-05595

WATER POLLUTION CONTROL POWERS.
For primary bibliographic entry see Field 6E.
W74-05596

HUMAN ECOLOGY AND COASTAL-ZONE POLLUTION,
Scripps Institution of Oceanography, La Jolla, Calif.
M. D. Bradley.
Water Air Soil Pollut. Vol 1, No 4, p 405-414, 1972.
Identifiers: *Coastal pollution, *Ecology, Land management, Water pollution, *Environmental resources.

The awareness of environmental problems has created a favorable climate for an intellectual orientation relevant to contemporary problems. Translating public opinion and legislation into long-range planning and rational policy for environmental resources is no simple task; an understanding of ecological principles, economic realities, and governmental jurisdictions and programs is needed. The present condition of inshore seas estuaries, and coastal-zones demonstrates how many immediately inadverse decisions prove damaging over the long run. The principles of general ecology, can provide helpful insights into managing the complex natural and human ecosystems of the coastal land-water interface. The concepts of carrying capacity, limiting factors, productivity, and homeostasis lead to a more complete understanding of pollution. Pollution can be defined as a residual, a left-over from production and consumption activities. Residual management becomes a matter of social choice, a process by which the underpriced assimilative capacity of the environment is treated as an input into social accounting and is priced accordingly. The ability of governments to provide effective management for environmental quality will depend upon the implementation of rationally determined development plans based on an understanding of residuals management. The natural resource ecosystems of coastal areas can provide man with increased benefits in the form of visual amenities, recreational benefits, and ecosystem homeostasis. Problems of management are critical and increasing.--Copyright 1973, Biological Abstracts, Inc.
W74-05597

POLLUTING STREAMS.
For primary bibliographic entry see Field 6E.
W74-05601

DEPARTMENT OF ENVIRONMENTAL CONSERVATION.
For primary bibliographic entry see Field 6E.
W74-05602

INTERSTATE MINING COMPACT.
For primary bibliographic entry see Field 6E.
W74-05604

PUBLIC WATER SUPPLY SYSTEMS.
For primary bibliographic entry see Field 6E.
W74-05606

WATER QUALITY AND EFFLUENT STANDARDS.
For primary bibliographic entry see Field 6E.
W74-05607

POLLUTING OR CONTAMINATING STATE WATERS.
For primary bibliographic entry see Field 6E.
W74-05608

POWER PLANT ENVIRONMENTAL RESEARCH PROGRAM.
For primary bibliographic entry see Field 6E.
W74-05609

SANITARY FACILITIES FUND.
For primary bibliographic entry see Field 6E.
W74-05612

POPULATION GROWTH, RESOURCE AVAILABILITY AND ENVIRONMENTAL QUALITY,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 6B.
W74-05614

AN OPERATIONAL MATHEMATICAL PROGRAMMING MODEL FOR THE PLANNING OF ECONOMIC ACTIVITIES IN RELATION TO THE ENVIRONMENT,
Netherlands School of Economics, Rotterdam. Economic Research Inst.
For primary bibliographic entry see Field 6B.
W74-05616

ENVIRONMENTAL IMPACT AND WATER DEVELOPMENT,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 6G.
W74-05619

ANALYSIS OF ECONOMIC IMPACTS OF ENVIRONMENTAL STANDARDS ON THE BAKERY INDUSTRY, PART I, EXECUTIVE SUMMARY.
Ernst and Ernst, Washington, D. C.
Available from National Technical Information Service as PB-207 169 $3.00 in paper copy, $1.45 in microfiche. Council on Environmental Quality, Washington, D.C. December 1971. 4 p.

Descriptors: *Costs, *Industries, *Pollution abatement, Water pollution control, *Economic impact, Pricing.
Identifiers: *Baking industry.

A study of the impacts of pollution abatement requirements on the bakery industry has concluded that present abatement costs have been low, a practical result of the mild effluent flow and low volume of waste discharge; estimates range from .01 to .02 cents per pound in bread and related products to 5 to 9 cents per pound in the biscuit and cracker industry. To meet existing standards it is probable that bakery firms will choose higher sewage costs rather sewage costs rather than construct their own facilities using expensive urban-suburban land. An examination of the industry shows a multiplicity of plant anf firm sizes primarily located according to the population

density, no plant producing more than 4% of the industry's output. Little or no economic impact is foreseen in employment, dislocation, regional trends, international trade, prices and profits as a result of present abatement requirements. Future abatement cost increases hinge on potential tertiary treatment requirement, odor control requirements and increased electricity costs reflecting new environmental standards. The potential welfare implication of increased bakery prices arising from new standards may show that the cost of meeting such standards in the bakery industry falls disproportionately on the poor. (Schroeder-Wisconsin)
W74-05623

WATER MANAGEMENT AND THE ENVIRONMENT.
Organization for Economic Co-Operation and Development, Paris (France). Water Management Section Group.
For primary bibliographic entry see Field 6G.
W74-05625

APPLICATION OF MICROECONOMIC MODELS TO REGIONAL ENVIRONMENTAL QUALITY MANAGEMENT,
Resources for the Future, Inc., Washington, D. C.
For primary bibliographic entry see Field 6A.
W74-05627

THE EXTERNALITIES OF A TORREY CANYON SITUATION; AN IMPETUS FOR CHANGE IN LEGISLATION,
McCarty and Noone, Washington, D.C.
H. J. McGurren.
Natural Resources Journal, Vol 11, No 2, p 349-371, 1971. 7 fig, 26 ref.

Descriptors: *Oil pollution, *Costs, *Legislation, *Compensation, Oil spills, Insurance, Equity, Regulation, Penalties(Legal), Water pollution control.
Identifiers: *Liability, Externalities.

In developing legislation satisfactorily dealing with equity and efficiency arising from oil spills, the questions to be resolved are: who should bear the cost, what amounts should be expended to prevent or cleanup spills, and what mechanism should be used. Efficiency conditions require that the marginal benefit from preventing or cleaning up spills equal the additional cost. At present, shippers do not consider these costs in their production decisions, creating efficiency questions. The shippers' equity in not paying the cost of oil spills also arises. A historical review of existing statutes reveals a continued reliance on court imposed penalties as a mechanism to solve these efficiency and equity questions. The cost of discovering the benefits and costs of reducing or cleaning up oil spills has lead the courts to rely on single penalties, resulting in inefficient cost curves. As an alternative, the imposition of strict liability and compulsory insurance is suggested, and graphically shows to lead to an efficient outcome. The inclusion of compulsory insurance is a remedy to compensate for existing liability limitations of a shipper's assets. The 1970 Water Quality Act includes both of these elements. (Schroeder-Wisconsin)
W74-05628

THE PROCEEDINGS OF A NATIONAL SYMPOSIUM ON COSTS OF WATER POLLUTION CONTROL.
North Carolina Research Triangle Universities, Raleigh; and Environmental Protection Agency, Washington, D.C.
Available from North Carolina Water Resources Research Institute, Raleigh, N.C. 27607, for $8.00 prepaid. Symposium held on April 6-7, 1972, Raleigh, North Carolina, published by Water Resources Research Institute, North Carolina University. 276 p, 35 fig, 56 tab, 35 ref.

Descriptors: *Environment, *Economic impact, *Pollution abatement, Waste water treatment, Water pollution control, Effluents, Municipal wastes, Industrial wastes, Water pollution, Air pollution, Capital costs, Operating costs, Regulation, Costs, Benefits, Investment, Treatment facilities, Federal government, Cost-benefit analysis, Pollution taxes(Charges), Population, Planning, Water quality standards, Social aspects, Federal Water Pollution Control Act, Model studies.
Identifiers: Cost effectiveness, Joint industrial-municipal waste treatment systems, Pollution control equipment, Effluent charge, Economic incentives, Surcharge, Zero discharge.

This proceedings of a national conference 'Costs of Water Pollution Control' contains twenty-one papers. The central issue was whether pollution abatement should be accomplished by zero discharge ligislation or by some form of economic feasibility approach. In general, the zero discharge approach was considered impractical. Ultimately the degree of pollution abatement would be dependent upon the public's willingness to pay. Pollution problems are concentrated and equal levels of treatment may not be required in all areas of the country, population growth considerations and modular construction should be used more in the treatment facility planning process, pollution abatement cost evaluations h ve placed too little emphasis on benefits and too much on costs, and cost effectiveness should be a prime guideline in pollution abatement planning. The capability of the economy to pay cleanup charges was examined. The degrees of cleanup and associated costs are illustrated. Municipal and industrial waste disposal was considered in terms of treatment facilities, equipment, and capital and operating costs as well as the question of separate industrial treatment plants versus joint municipal-industrial plants. Also included were methodologies to assess cost effectiveness design and management practices, economic impact, economic feasibility, surcharges and economic incentives. (See W74-05630 thru W74-05643) (Pinsky-Wisconsin)
W74-05629

ECONOMIC IMPLICATIONS OF ALTERNATIVE NATIONAL POLICIES FOR WATER POLLUTION CONTROL,
Environmental Protection Agency, Washington, D.C. Planning and Evaluation Branch.
R. Luken, and M. Pisano.
In: Proceedings of a National Symposium on Costs of Water Pollution Control, April 6-7, 1972, Raleigh, North Carolina, p 29-47. 1 fig, 9 tab.

Descriptors: *Water quality, *Waste water treatment, *Expenditures, *Economic impact, Water pollution, United States, Effluents, Environmental control, Capital, Marginal costs, Municipal wastes, Industrial wastes, Treatment facilities, Regulation, Standards.
Identifiers: Clean Water Program.

The Environmental Protection Agency uses a three dimension index of pollution, called the PDI index, which considers the prevalence, duration and intensity of pollution. Using this index it was found that pollution problems are concentrated rather than universal and that equal levels of treatment may not be required in all areas of the country. Also, the PDI data supports controlling non-traditional pollution points sources. The marginal cost of pollution treatment rises rapidly as higher levels of treatment are achieved. The total cost of municipal waste treatment facility construction is estimated at $18.1 billion by EPA through fiscal 1976, while an estimate derived from an evaluation of data from the Municipal Waste Inventory for 1971 is $14.3 billion. The cost of pollution control investment for the industrial sector is estimated to range between $8.1 and $12.2 billion. All costs for attainment of effluent standards for the industrial sector amount to a cash outlay of $20 billion for the period 1968-1976. Since EPA is interested in meeting its stated objectives at the lowest possible costs, cost effectiveness and the efficient use of resources are stressed. A possible cost minimizing alternative is a national effluent charge. (See also W74-0562[illegible] (Pinsky-Wisconsin)
W74-05630

ECONOMIC IMPLICATIONS OF ALTERNATIVE NATIONAL GOALS,
National Wildlife Federation, Washington, D. C.
T. L. Kimball.
In: Proceedings of a National Symposium o Costs of Water Pollution Control, April 6-7, 197 Raleigh, North Carolina, p 48-56.

Descriptors: *Economics, *Environmen *Pollution abatement, *Costs, Water pollutio Capital, Federal government, Air pollution, Cos benefit analysis, Surveys, Social participation.
Identifiers: *Opinion polls, Goals.

There are two choices in terms of alternative n tional goals, zero pollution, or that amount of po lution control which is economically feasibl There is neither the capital nor the public suppo for the former, so the real question is: What economically feasible. This will not be decided b economists, but by how much the average citize will pay to clean up the environment. The public concerned about the environment, with a 196 Harris Public Opinoin Poll indicating that four o of five Americans are either concerned or deepl concerned about the environment. The Nation Wildlife Federation determined that a reasonabl clean up program would require an investment c $10.2 billion annually (or $170 per family) for fiv years, while the pollution damage would ever tually be reduced by $22.2 billion annually. Ap proximately half of those interviewed in a surve favored paying the $170 per family to clean up po lution now and save money in costs eventuall Another consideration of alternatives, the Club o Rome study, indicates that the policy makers an scientific community should study whether e ponential growth is the only means to achievin progress and maintaining economic stability. (Se also W74-05629) (Pinsky-Wisconsin)
W74-05631

COST EFFECTIVENESS OF REGIONAL WASTEWATER SYSTEMS,
Environmental Protection Agency, Washington D. C. Systems Application Section.
For primary bibliographic entry see Field 5D.
W74-05632

COST EFFECTIVENESS OF CURRENT ENVIRONMENTAL ENGINEERING PRACTICES,
Camp, Dresser McKee, Boston, Mass.
R. C. Marini.
In: Proceedings of a National Symposium o Costs of Water Pollution Control, April 6-7, 1972 Raleigh, North Carolina, p 90-100.

Descriptors: *Environmental engineering *Treatment facilities, *Costs, *Economic feasibili ty, Pilot plants, Mathematical models, Compute models, Waste water treatment, Surveys, Con struction, Management, Pollution abatement Federal Water Pollution Control Act.
Identifiers: *Cost effectiveness, Clean Water Pro gram, Construction management.

Social benefits commensurate with the Clea Water Program are only possible if cost effectiv design and management practices are followed Optimal solutions to environmental engineering problems are developed by the following steps: (1 Listing feasible, effective solutions; (2) Prelimina ry assessment of relative economies and impracti cal solutions; (3) Verification of feasibility remaining solutions are not in common use; (4 Economic comparison of remaining alternative on the basis of generalized costs; (5) If selection

not clear-cut, vigorous functional and cost comparison of few remaining alternatives; (6) Avoidance of unnecessarily high factors of safety and of unnecessary embellishments during final design; and (7) Selection of optimum capacity-design periods for facilities based on representative discounting rates, economy-of-scale parameters and patterns of expected demand increase. Pilot plants, computers and mathematical models, industrial waste surveys, and construction management are useful tools in this approach. While the elimination of all pollutants in the waterways by 1985 is theoretically possible, its implementation, as proposed in the Federal Water Pollution Control Act, would require expenditures of more than $316 billion. The 95 to 99 percent pollutant removal level would cost only $118 billion indicating that the cost effectiveness of the program should be evaluated. (See also W74-05629) (Pinsky-Wisconsin)
W74-05633

ECONOMIC GUIDELINES FOR ANALYSIS OF JOINT INDUSTRIAL-MUNICIPAL COLLECTION AND TREATMENT SYSTEMS,
Quirk, Lawler and Matusky Engineers, Tappan, N.Y.
For primary bibliographic entry see Field 5D.
W74-05634

EFFECTIVE POLLUTION CONTROL INVESTMENT,
Environmental Protection Agency, Washington, D.C. Div. of Municipal Waste Water Programs.
For primary bibliographic entry see Field 5D.
W74-05635

THE PRESENT AND FUTURE MARKET FOR POLLUTION CONTROL EQUIPMENT,
Business and Defense Services Administration, Washington, D.C. Water Resources and Engineering Services Div.; and Bureau of Domestic Commerce, Washington, D.C.
K. L. Kollar, and R. Brewer.
In: Proceedings of a National Symposium on Costs of Water Pollution Control, April 6-7, 1972, Raleigh, North Carolina, p 158-167.

Descriptors: *Equipment, *Water pollution control, *Investment, *Economic prediction, Construction, Waste water treatment, Costs, Environmental control, Treatment facilities, Marketing.
Identifiers: Pollution control equipment.

The Council of Environmental Quality and the EPA estimate the direct costs of cleaning up the environment to be $105 billion between 1970 and 1975, with water pollution control costs increasing from $3.1 to $5.8 billion annually. These figures, while large, are not beyond the capability of the national economy. Most of the money to be spent for pollution control is for construction rather than equipment. Of total wastewater expenditures, only 5.4 percent consists of pollution control equipment, with that figure rising to about 12 percent for water supply treatment plants. An evaluation of the backlog, obsolescence, depreciation, future growth, and feasible market indicates that a $30.0 billion municipal construction program may be expected to be completed by 1980. Using the same information, the industrial market would be $11.8 billion for this same time period. This results in a total water pollution control market between 1971-1980 of $41.8 billion for construction and $5.7 billion for equipment. (See also W74-05629) (Pinsky-Wisconsin)
W74-05636

POLLUTION CONTROL POLICY AND THE EFFICIENT ALLOCATION OF RESOURCES,
Council of Economic Advisors, Washington, D.C.
A. K. McAdams.
In: Proceedings of a Symposium on Costs of Water Pollution Control, April 6-7, 1972, Raleigh, North Carolina, p 172-187. 2 fig, 3 tab.

Descriptors: *Cost-benefit analysis, *Pollution abatement, *Economic impact, Cost-benefit ratio, Water pollution, Air pollution, Effluents, Marginal costs, Gross National Product, Inflation, United States, Pollution taxes(Charges), Market value, Costs, Benefits.

Pollution control costs are looked at in order to determine if the United States can afford pollution control. It would cost $60 billion between 1972 and 1982 to remove 87 percent of the pollutants from water, while removing the next 10 percent would cost $60 billion more, and the final 3 percent an additional $200 billion. These figures suggest marginal costs which rise exponentially. A study indicates that with the pollution control costs currently mandated, the rate of growth in real GNP would decline by $6 billion annually versus the base line average, and this minor amount could be offset by appropriate monetary and fiscal policies. Inflation is shown to be unaffected by pollution control expenditures, though it would rise 0.26 percent annually if fiscal or monetary offsets were instituted. Thus, the U.S. can afford pollution control. In order to meet the pollution control question in practice, the private decision maker should be guided to take actions which benefit himself and automatically benefit society. This can be done by setting a fee for the creation of pollutants which would be equal to benefits derived by the removal of those pollutants. This would internalize pollution costs and more efficiently allocate resources. (See also W74-05629) (Pinsky-Wisconsin)
W74-05637

ECONOMIC INCENTIVES IN WATER POLLUTION CONTROL,
Bowdoin Coll., Brunswick, Maine. Dept. of Economics.
A. M. Freeman.
In: Proceedings of a National Symposium on Costs of Water Pollution Control, April 6-7, 1972, Raleigh, North Carolina, p 188-200.

Descriptors: *Economic efficiency, *Effluents, *Water pollution control, *Pollution taxes(Charges), Air pollution, Federal government, State governments, Cities, Marginal costs, Environment, Costs, Regulation, Law enforcement, Pollution abatement.
Identifiers: *Effluent charge, *Economic incentives, Subsidies, Waste discharge.

A shift in government pollution control policy toward a program based on economic incentives and away from one based on regulation, enforcement and subsidy is advocated. The present policy has two elements. It provides federal subsidies to cities for the construction of waste treatment plants, and it regulates effluent discharges and enforces these regulations through the courts. The subsidy aspect has been unsuccessful due to lack of planning, the absence of necessary incentives to cities, and the perverse incentives to firms which lead to wasted resources. The regulation/enforcement aspcet has also been unsuccessful, for it is basically a lengthy bargaining process between polluters with great interest and regulators representing a diffused public. The recommended policy would put a price on environmental resources. With a charge made for the discharge of wastes, polluters would have an incentive to reduce discharges to the environment. Polluters would determine their level of discharge based on the marginal cost of eliminating the effluent versus the charge. The residual charge should be set at a level which limits discharge to that consistent with acceptable levels of air and water quality. An effluent charge policy would be both more efficient and more effective than the present regulation-enforcement policy. (See also W74-05629) (Pinsky-Wisconsin)
W74-05638

WATER AND WASTEWATER SURCHARGES AS ECONOMIC INCENTIVES,
North Carolina State Univ., Raleigh. Dept. of Economics.
J. A. Seagraves.
In: Proceedings of a National Symposium on Costs of Water Pollution Control, April 6-7, 1972, Raleigh, North Carolina, p 201-209. 2 fig, 1 tab, 3 ref.

Descriptors: *Waste treatment, *Water pollution control, *Pollution taxes(Charges), Effluents, Sewers, Institutions, Industrial wastes, Cities, Elasticity of demand, Permits, Costs, Benefits, Textiles, Pulp and paper industry, Chemical industry, Food processing industry.
Identifiers: *Economic incentives, *Surcharge, Transferable permits.

Many cities have added a surcharge, based on the strength of industrial wastes, to water and sewer bills. Using data from four high-polluting industries, food processing, textiles, chemical and pulp and paper, an equation (T=86-14.6 S) was derived relating industrial wastes per $1000 of value added in manufacturing (T) to the amount of the surcharge (S). It was also found that a one percent increase in the surcharge is associated with an 0.8 percent decline in wastes and a 0.6 percent decline in water usage. A one percent increase in the price of water is associated with a 1.0 percent decrease in industrial wastes and a 0.7 percent decrease in industrial water usage. The surcharge is typically set at the city's estimated cost of treating wastes. This method is shown to result in a net benefit to society. An alternative method based on transferable effluent permits would allocate a property right, yet it would still force industry to recognize the opportunity value of reducing wastes. This method would reduce wastes, but it would not restrict a municipality's ability to attract or maintain industry, as a surcharge might. (See also W74-05629) (Pinsky-Wisconsin)
W74-05639

INDUSTRY VARIANCE OF CONSUMER PRICES AND COMPETITION AS A CONSEQUENCE OF WATER POLLUTION ABATEMENT,
Auburn Univ., Ala., School of Business.
For primary bibliographic entry see Field 5D.
W74-05640

BENEFIT-RELATED EXPENDITURES FOR INDUSTRIAL WASTE TREATMENT,
S_ acuse Univ., N.Y. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-05641

COSTS OF WATER POLLUTION CONTROL IN THE CHEMICAL INDUSTRY,
Datagraphics, Inc., Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W74-05642

COSTS OF WATER POLLUTION CONTROL IN THE PAPER INDUSTRY,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W74-05643

ECONOMIC GROWTH VS. ENVIRONMENTAL PROTECTION: WHAT WILL BE THE OUTCOME,
Wisconsin Univ., Madison. Dept. of Economics; and Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W74-05644

SOME REMARKS ON AQUACULTURE,
Hawaii Univ., Honolulu.

For primary bibliographic entry see Field 6C.
W74-05647

MOVEMENT OF NITRATES UNDER IRRIGATED AGRICULTURE,
Nebraska Univ., Lincoln. Coll. of Engineering and Architecture.
For primary bibliographic entry see Field 5B.
W74-05666

OIL ACCUMULATOR,
Massachusetts Inst. of Tech., Cambridge. (assignee).
J. B. Nugent.
U.S. Patent No. 3,768,656, 3 p, 3 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 915, No 5, p 1717, October 30, 1973.

Descriptors: *Patents, Oil spills, *Oil pollution, *Pollution abatement, Water quality control, Water pollution control, Separation techniques.
Identifiers: *Accumulators(Oil).

The oil accumulator comprises a floatable box which is open at the top and bottom. The stern is closed and the bow is open. Appropriately located with the box is a ramp designed so that when a wave with oil on its surface enters the box, it is caused to surge up the ramp and spill over it. The oil is trapped within the box but the water is free to exit through the open bottom. Accumulators are inserted at appropriate intervals in the boom systems which, in turn, are arranged to channel the oil into the accumulators. (Sinha - OEIS)
W74-05688

APPARATUS FOR REMOVING OIL AND OTHER FLOATING CONTAMINANTS FROM A MOVING BODY OF WATER,
J. W. Strohecker.
Available from NTIS as PAT-APPL-203267, $3.00 paper copy, $1.45 microfiche. Atomic Energy Commission Patent Application Serial No. 203,267(70), November 1971. 12 p, 4 fig.

Descriptors: *Patents, *Skimming, *Oil pollution, Oil spills, *Pollution abatement, Water quality control, *Flotsam, *Separation techniques.

This skimming system uses the natural gravitational flow of water. It consists of a diversion boom positioned diagonally across a stream and in registry with the surface of the latter for intercepting and diverting floating contaminants into a weir. The weir is located in the stream bank upstream from but adjacent to the downstream end of the boom. The weir is ballasted so that the contaminants are directed through or over the weir. The contaminants then are conveyed through a conduit and discharged into a retention basin which contains an under flow weir. The boom is designed to adapt to changing water level. (Sinha - OEIS)
W74-05691

WATER POLLUTION,
Robert S. Kerr Water Research Center, Ada, Okla.
For primary bibliographic entry see Field 5B.
W74-05740

EROSION CONTROL,
Soil Conservation Service, Stillwater, Okla.
For primary bibliographic entry see Field 2J.
W74-05741

SEWAGE WORKS OF MUNICIPAL CORPORATIONS AND SANITARY DISTRICTS,
For primary bibliographic entry see Field 6E.
W74-05745

PUBLIC SERVICE DISTRICTS FOR WATER AND SEWERAGE SERVICES.
For primary bibliographic entry see Field 6E.
W74-05746

NATURAL AREAS PRESERVATION.
For primary bibliographic entry see Field 6E.
W74-05748

UNLAWFUL SEWAGE DISPOSAL.
For primary bibliographic entry see Field 6E.
W74-05749

WILL SUCCESS SPOIL NEPA,
For primary bibliographic entry see Field 6E.
W74-05750

MUNICIPAL WATER POLLUTION CONTROL--STANDARDS OF QUALITY AND PURITY.
For primary bibliographic entry see Field 6E.
W74-05752

WATER POLLUTION CONTROL--ENFORCEMENT.
For primary bibliographic entry see Field 6E.
W74-05753

WATER RESOURCES MANAGEMENT.
For primary bibliographic entry see Field 6E.
W74-05756

POLLUTION CONTROL AGENCY.
For primary bibliographic entry see Field 6E.
W74-05757

WATER POLLUTION--CLASSIFICATION OF WATER SUPPLY AND WASTE WATER TREATMENT FACILITIES.
For primary bibliographic entry see Field 6E.
W74-05758

ENVIRONMENTAL LAW--RIVERS AND HARBORS APPROPRIATIONS ACT--PRIVATE PERSONS MAY NOT SUE IN QUI TAM WITHOUT EXPLICIT GRANT OF PERMISSION FOR CITIZEN SUITS.
For primary bibliographic entry see Field 6E.
W74-05763

WASTE DISCHARGE PERMITS: NO DEFENSE TO WATER POLLUTION ACTIONS,
Lewis and Clark Coll., Portland, Oreg. Northwestern School of Law.
A. E. Staines.
Environmental Law, p 181-188, Winter 1971. 37 ref.

Descriptors: *Legal aspects, *Water pollution, *Water pollution control, *Water policy, *Public rights, Permits, Legislation, *Oregon, Water, Water pollution sources, Abatement, Pollution abatement, Non-structural alternatives, Water quality, Water quality control, Water quality standards, Water resources.
Identifiers: Injunctive relief, Nuisance(Legal aspects).

Under Oregon law, public interest in maintaining pollution-free waters prohibits a waste discharge permit from being employed as a defense in a state abatement pro specifications. A new section of this statute provides that any permit to build aceeding or prosecution for water pollution. Such a permit is equally ineffective as a defense in a private injunctive suit or damage action for water pollution. Since permits can confer no greater rights than the law itself grants, and since the law prohibits water pollution, discharge permits cannot authorize such pollution. Accordingly, issuance of such a permit does not sanction any nuisance which results from polluting acts. Oregon law provides that the state has title to the land below a navigable river's high water line. The state also owns all water sources. Since water pollution is prohibited, to allow such pollution is to permit an illegal private use of public property. Since an administrative agency possesses only those powers expressed in its enabling act, a waste discharge permit allowing water pollution is void as beyond the agency's powers over public property. (Ritchie-Florida)
W74-05764

COUNTY OF FREEBORN V. BRYSON (DECLARATORY JUDGMENT ACTION CONCERNING PORTIONS OF A NATURAL WILDLIFE MARSH).
For primary bibliographic entry see Field 6E.
W74-05765

A BILL AMENDING THE PUBLIC HEALTH SERVICE ACT AND THE FEDERAL FOOD, DRUG, AND COSMETIC ACT IN ORDER TO ASSURE SAFE DRINKING WATER.
For primary bibliographic entry see Field 6E.
W74-05767

WATER POLLUTION--PENALTY PROCEEDINGS.
For primary bibliographic entry see Field 6E.
W74-05772

REGULATIONS CONCERNING WASTE DISCHARGE REQUIREMENTS, NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
California State Water Resources Control Board, Sacramento.
May 1973. 42 p.

Descriptors: *California, *Waste discharge, *Permits, *Water quality control, *Administrative agencies, Water quality, Water control, Water policy, Standards, Regulations, Federal government, State governments, Pollutants, Environmental sanitation, Waste disposal, Pollution sources, Industrial wastes, Agricultural wastes, Cities, Treatment facilities, Water law, Legal aspects, Water resources development, Conservation, Ecological impact, Legislation.

The Waste Discharge Requirements of the National Pollution Discharge Elimination System (NPDES) for California, as authorized by the California Administrative Code are described. The regulation of water is carried out by the State Water Resources Control Board, and nine regional Water Quality Control Boards. Waste discharge requirements (permits) are adopted for each individual discharger, to protect water quality. Each contains limits on the quality of the effluents and specifies conditions to be maintained in the receiving waters. Monitoring is required, especially where concentrations of substances critical to downstream beneficial uses can be expected to vary greatly. No waste discharge requirements will be issued if: the discharge contains a radiological, biological or chemical warfare agent; or high level radioactive waste; such would substantially impair anchorage or navigation; or the federal administrator objects in writing. Permits are required for municipal treatment plants, agricultural facilities and industrial discharges. California standards must be within the bounds of those outlined by the administrator of the Environmental Protection Agency and subject to their regulation. (Silber-Florida)
W74-05777

AMERICAN WATERWAYS: FLORIDA OIL POLLUTION LEGISLATION MAKES IT OVER FIRST HURDLE,
Oregon Univ., Eugene. School of Law.

'. N. Swan.
ournal of Maritime Law and Commerce, Vol 5, Vo 1, p 77-110, October 1973. 199 ref.

)escriptors: *Florida, *Legislation, *Pollution ontrol, *Legal aspects, *Water law, Water quali-y, Water quality control, Water resources, Water olicy, Judicial decisions, Shores, Beaches, Oily vater, Pollutants, Polllution effects, Standards, legulation, State governments, Vessels, Ports, Harbors, Facilities, Structures, Navigable waters,)ceans, Sea water, Federal government, Licen-es, Permits, Standards, Navigation, Pollution ef-ects, Pollution abatement.

The 1970 Florida Oil Spill Prevention and Pollution Control Act deals with measures to reduce the likelihood of accidental spills as well as with civil obligations to compensate those harmed by the scaped oil or other pollutants. The Act applies to erminal facilities in Florida's ports and to ships estined to or leaving such facilities. The United States Supreme Court in Askew v. American Waterways Operators upheld Florida's right under he police power to impose liability in damages for osses suffered by both the state and by private in-erests. Attacked on the basis that it would be un-uly burdensome to interstate commerce, the Court found ample enabling power in the Tenth Amendment and various other decisions holding hat states are often in the best position to protect he health and welfare of their own citizens. The Florida statute is designed to serve five basic pur-oses: to confer licensing authority; to regulate the leliverance and transference of hazardous materi-ls; to establish a compensation-and-control-ex-ense fund; to make terminal operators and car-iers strictly liable for pollution damage; and to nake them responsible for removing escaped pol-utants. (Silber-Florida)
W74-05778

NO FAULT LIABILITY FOR OIL POLLUTION DAMAGE,
S. Bergman.
ournal of Maritime Law and Commerce, Vol 5, Vo 1, p 1-50, October 1973. 194 ref.

)escriptors: *Pollution control, *Pollution abate-nent, *Water law, *Water policy, *Legislation, Water quality, Water quality control, Water esources development, Pollutants, Pollution ources, Pollution effects, Shores, Beaches, Coastlines, Oceans, Sea water, Legal aspects, Standards, Regulations, State governments, Federal government, Project purposes, Planning, Water management, Water development, Indus-ry, Vessels, Ports, Harbors.

The imposition of liability regardless of fault on all oil-bearing tanker vessels, for all public and rivate property and commercial damage resulting rom any accidental oil spill occurring adjacent to he coast is advocated. The magnitude and intensi-y of maritime oil pollution problems today, apacity to deal with accidental spills, and what to nticipate in the technological future are lescribed. Past and present legislative assaults on ccidental polluters is outlined. The imposition of bsolute liability is proposed as a solution and arious legal and economic bases for so doing are xamined. The conclusion seeks to respond to ossible practical challenges to the feasibility of mplementing the proposal of absolute liability. Silber-Florida)
W74-05779

INTERNATIONAL IMPACT REPORTS AND THE CONSERVATION OF THE OCEAN ENVIRONMENT,
Syracuse Univ., N.Y. Coll. of Law.
. F. E. Goldie.
Natural Resources Journal, Vol 13, No 2, p 256-81, April 1973. 80 ref.

Descriptors: *Oceans, *Sea water, Development, *Long-term planning, *Pollution control, *International law, *International agreements, Mining, Effluents, Pollutants, Water resources, Water resources development, Water management, Water law, Legal aspects, Judicial decisions, Water policy, Water utilization, Water demand, Water control, Federal government, Environmental effects, Environmental sanitation, Conservation.

It has been suggested that one way to assure proper management and minimal adverse effects to undersea development, such as mining, would be to extend the requirement of impact studies and the permit system now used in the United States. Among the aspects to be considered in development of ocean resources is whether there will be any adverse environmental effects, or any irreversible or irretrievable commitment of resources. International interests must also be recognized and a worldwide agreement as to some conservation and environmentally protective policy must be reached to prevent wholesale raping of the ocean's wealth. Legislation analogous to the National Environmental Policy Act of 1970 (NEPA) is desirable to preserve and enhance the resources and prevent degradation to the oceans. Some references are made to litigation involving the NEPA to illustrate the judicial construction given to various provisions of the Act for future applications. Focusing on 'rights and amenities' and the nature of the obligation of full disclosure the courts recognize that among all of those competing interests, some practical solution must emerge to preserve these same resources for future generations. (Silber-Florida)
W74-05781

THE VALUE OF THE TIDAL MARSH,
Georgia Univ., Athens. Inst. of Ecology.
For primary bibliographic entry see Field 2L.
W74-05782

WHO GOVERNS LOCAL WATERS,
Miami Univ., Fla. Ocean Law Program.
For primary bibliographic entry see Field 6E.
W74-05784

LAFAYETTE PUBLIC HEARING TESTIMONY.
Louisiana Advisory Commision on Coastal and Marine Resources, Baton Rouge.
For primary bibliographic entry see Field 2L.
W74-05785

LAKE CHARLES PUBLIC HEARING TESTIMONY.
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
For primary bibliographic entry see Field 2L.
W74-05786

HAMILTON V. DIAMOND (PROCEEDING SEEKING TO HAVE PERMIT TO FILL HUDSON RIVER AT CERTAIN ADDRESS DECLARED ILLEGAL AND VOID).
For primary bibliographic entry see Field 6E.
W74-05789

A FOUL TIDE,
For primary bibliographic entry see Field 5B.
W74-05793

PENALTIES FOR WATER POLLUTION.
For primary bibliographic entry see Field 6E.
W74-05797

BIG CYPRESS CONSERVATION ACT.
For primary bibliographic entry see Field 6E.
W74-05798

A DOUBLE MARINE DISASTER,
For primary bibliographic entry see Field 5B.
W74-05800

SUPERIOR-MICHIGAN-HURON-ERIE-ONTARIO: IS IT TOO LATE,
G. Young.
National Geographic, Vol 144, No 2, p 147-185, August 1973. 17 photo.

Descriptors: *Great Lakes, *Bodies of water, *Lake beds, *Inland waterways, *Recreation, Lake Erie, Lake Huron, Lake Michigan, Lake Ontario, Lake Superior, Lake breezes, Freshwater, Thermal properties, Self purification, Water levels, Lake shores, Lake fisheries, Lampreys, Aquatic life, Waste disposal.

Of the five Great Lakes only Lake Superior, the largest, has shown no increase in dissolved solids during a 60 year period. The lower Great Lakes are being sorely stressed by the cities, farms, and industries lining their shores, and by the polluted rivers flowing into them. Demographers predict that a complex of cities will ring Lakes Erie and Ontario and most of Lake Michigan causing pollution problems to increase. An extensive tour of the Great Lakes is described and many of the pollution problems facing them as well as some possible solutions are discussed. These solutions are immensely complex, for many sources of pollution and many jurisdictional units are involved. (Comfort-Florida)
W74-05801

CAN WE SAVE OUR SALT MARSHES,
Connecticut Agricultural Experiment Station, New Haven.
For primary bibliographic entry see Field 2L.
W74-05803

JACK AND THE DRAGLINE,
For primary bibliographic entry see Field 2L.
W74-05804

PROPOSED CHATTOOGA NATIONAL WILD AND SCENIC RIVER, NORTH CAROLINA, SOUTH CAROLINA, AND GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D.C.
Available from the National Technical Information Service, Springfield, Va, 22151, as EIS-NC-73-0589-F, for $4.25 paper copy, $1.45 microfiche. (1973). 58 p, 1 map, 2 photo.

Descriptors: *Environmental effects, Environmental control, Growth rates, Rivers, *Regulation, Management, Water policy, Vegetation, Georgia, South Carolina, North Carolina, Land use, *Wild River Act, Recreation, *Southeast U.S.
Identifiers: *Environmental impact statements, Jackson and Macon Co. N.C., Rabun Co. Ga., Oconee Co. S.C.

The Chattooga River flows through North Carolina, Georgia, and South Carolina. The proposal provides the means for protecting the river and adjacent lands from adverse environmental effects. The impact of increased recreational use will be controlled through regulations based on the carrying capacity of the river and land rather than on demand. The region around the river contains a rich variety of plant life, including a mixed composition of timber. In general, the immediate environment of the Chattooga is fragile, and overuse could result in deterioration and destruction of some of its unique plant life and aesthetic quality. The alternatives considered for the river's protection are: taking no action; development of the river for hydropower; and protection of the river through designation as a Federally administered river in the National Wild and Scenic Rivers System. (Daniels-Florida)
W74-05805

ENVIRONMENTAL QUALITY ANNUAL REPORT (3RD) OF THE COUNCIL ON ENVIRONMENTAL QUALITY.
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 6G.
W74-05807

ENVIRONMENTAL LAW--ZONING--ORDINANCE PROHIBITING FILLING OF WETLANDS ADJACENT TO NAVIGABLE WATERS, WITHOUT PERMIT IS CONSTITUTIONAL EXERCISE OF POLICE POWER NOT REQUIRING COMPENSATION.
For primary bibliographic entry see Field 6E.
W74-05815

FEDERAL COMMON LAW IN INTERSTATE WATER POLLUTION DISPUTES,
R. J. Trompeter.
University of Illinois Law Forum, Vol 1973, No 1, p 141-161, 1973. 145 ref.

Descriptors: *Pollution control, *Pollution abatement, *Judicial decisions, *Legal aspects, *Water law, Legislations, State governments, Federal government, Water rights, Water policy, Water control, Water management, Standards, Regulations, Cooperation, Pollution sources, Pollution effects, Environmental effects, Pollutants, Rivers, Streams, Lakes, Navigable waters, Water demand.

Since air and water pollutants never respect state boundaries, numerous lawsuits in which one state has sought abatement of polluting sources in another state have been heard since the turn of the century. Two questions become implicit. What demands are reasonable, and how is a state to make and enforce these demands. The Federal Water Pollution Control Act gave primary responsibility for control of water pollution to the states. This procedure was entangled with complex committees, conference and hearings and no party could find relief for at least a year after filing their complaint. In addition to being inefficient and time consuming, the Act's standards were wholly inadequate to deal with interstate pollution controversies. Each state could set its own standards or as some called them--'licenses to pollute.' Emerging from the ineptness of the Act, states have been invoking the original jurisdiction of the Supreme Court and contending that 'federal common law' must rule the substantive issues of the cases. In declining in Illinois v. Wisconsin to do so, on other grounds, the Supreme Court has recognized this 'federal common law' as a viable device to attack and solve interstate pollution disputes. (Silber-Florida)
W74-05816

ENVIRONMENTAL PROTECTION.
For primary bibliographic entry see Field 6E.
W74-05818

COMPLEX USE OF VOLGA WATER RESOURCES (KOMPLEKSNOYE ISPOL'ZOVANIYE VODNYKH RESURSOV VOLGI),
For primary bibliographic entry see Field 3F.
W74-05837

A REVIEW OF WASTEWATER PROBLEMS AND WASTEWATER MANAGEMENT PLANNING IN THE SAN FRANCISCO BAY REGION, CALIFORNIA.,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5D.
W74-05863

THE MANAGEMENT OF WATER IN ENGLAND AND WALES: THE CASE FOR REFORM,
Department of the Environment, London (England).
For primary bibliographic entry see Field 6B.
W74-05865

ENVIRONMENTAL QUALITY PLANNING - GOALS, POLICIES, AND OBJECTIVES.
East-West Gateway Coordinating Council, St. Louis, Mo.
For primary bibliographic entry see Field 6B.
W74-05876

WATER SUPPLY AND WATER POLLUTION CONTROL CAPITAL PROGRAM, 1972-1985.
Delaware Valley Regional Planning Commission, Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W74-05877

APPARATUS FOR REMOVING OIL AND OTHER FLOATING CONTAMINANTS FROM A MOVING BODY OF WATER,
Atomic Energy Commission, Washington, D.C. (assignee)
J. W. Strohecker.
U.S. Patent No. 3,779,385, 4 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 917, No 3, p 960, December 18, 1973.

Descriptors: *Patents, Oil spills, *Oil pollution, *Pollution abatement, *Flotsam, *Skimming, Separation techniques, Water pollution control, Water quality control, Equipment, Weirs.

Floating contaminants such as oil and solid debris are removed from a moving body of water by employing a skimming system which utilizes the natural gravitational flow of the water. A boom diagonally positioned across the body of water diverts the floating contaminants over a floating weir and into a retention pond where an underflow weir is used to return contaminant-free water to the moving body of water. The floating weir is ballasted to maintain the contaminant-receiving opening so that it is slightly below the surface of the water during fluctuations in the water level. This permits skimming the contaminants with minimal water removal. (Sinha-OEIS)
W74-05881

OIL RECOVERY SYSTEM,
Bridgestone Tire Co. Ltd., Tokyo (Japan). (assignee)
T. Muramatsu, K. Aramaki, and Y. Kondo.
U.S. Patent No. 3,771,662, 5 p, 7 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 916, No 2, p 538, November 13, 1973.

Descriptors: *Patents, Oil spills, *Oil pollution, *Pollution abatement, Water pollution control, Water quality control, Separation techniques.
Identifiers: *Oil fence, Oil films.

An oil fence assembly includes an elongated belt having two parallel longitudinal edges each of which can flex in a longitudinal direction. A flexible float, preferably tubular, connects to the belt so as to extend in the longitudinal direction of the belt. The U-shaped oil fence is moved on the water surface so as to sweep the spilled oil into an area defined between two leg portions. An oil-collecting zone is formed in the U-shaped oil fence line, where all the oil films swept thereby are collected to form a comparatively thick oil film. The oil may be removed from that zone. (Sinha-OEIS)
W74-05886

DYNAMICALLY EFFECTIVE OIL-GUIDE-BOOM AND METHOD FOR PURIFYING WATER EMPLOYING THE SAME,
H. R. Steltner.
U.S. Patent No. 3,779,382, 4 p, 3 fig, 3 ref; Officia Gazette of the United States Patent Office, Vo 917, No 3, p 959, December 18, 1973.

Descriptors: *Patents, Oil spills, *Oil pollution *Skimming, *Water purification, *Pollution abate ment, Water quality control, Water pollution con trol.

An oil-guide-boom which is effective in th removal of surface oil and residue from flowin water is disclosed. The boom includes two suppor members and a sheet extending between the sup ports in a trough-like manner. The sheet comprise a wire mesh material and a non-woven fabric. I operation the boom is placed in water toward th direction of flow so as to allow water to pas through the mesh portion of the sheet and to col lect in the trough portion of the sheet. The boon has particular utility in that its structure an materials allow continuous removal of surface im purities from flowing water. Method of purifyin water containing oil on the surface which utilize the oil-guide-boom is also disclosed. (Sinha-OEIS W74-05888

VORTEX OIL-WATER SEPARATOR SYSTEM PROVIDING CLEAN WATER,
United Aircraft Corp., East Hartford, Conn.
D. P. Miller.
U.S. Patent No. 3,780,865, 5 p, 5 fig, 2 ref; Officia Gazette of the United States Patent Office, Vo 917, No 4, p 1327, December 25, 1973.

Descriptors: *Patents, *Oil pollution, *Pollutio abatement, *Separation techniques, Equipment.
Identifiers: Ballast, Bilge water, *Vortex separa tor.

A vortex separator is used to separate a mixture o materials of different densities, such as an oil water mixture, into two components. The mixtur is injected tangentially into one end of a cylindrica chamber at a high flow rate to impart a swirl to th flow in the chamber. Clean or recirculated water injected into the chamber from the opposite en wall. The separated water is exhausted from th chamber through a port in the center of the en wall containing the water injectors, and th separated oil is exhausted through a small duc located at the center of the water exhaust port Two or more separators may be connected in se ries for applications in which a ship's ballast o bilge water is separated into a first componen containing primarily oil which can be stored in small volume, and a second component of sub stantially pure water which may be dumped over board. A baffle plate may be added in the chambe to improve the separation process. (See also W74 05894) (Sinha-OEIS)
W74-05893

VORTEX OIL-WATER SEPARATOR SYSTEM PROVIDING CLEAN WATER,
United Aircraft Corp., East Hartford, Conn.
A. E. Mesing.
U.S. Patent No. 3,780,862, 5 p, 5 fig, 5 ref; Officia Gazette of the United States Patent Office, Vo 917, No 4, p 1326, December 25, 1973.

Descriptors: *Patents, *Oil pollution, *Pollutio abatement, *Separation techniques, Equipment Water pollution control, Water quality control.
Identifiers: Ballast, Bilge water, *Vortex separa tor.

A vortex separator is used to separate a mixture o materials of different densities, such as an oil water mixture, into two components. The mixtur is injected tangentially into one end of a cylindrica chamber at a high flow rate to impart a swirl to th flow in the chamber. Clean or recirculated water i injected into the chamber from the opposite en wall. The separated water is exhausted from th chamber through a port in the center of the en wall containing the water injectors, and th

parated oil is exhausted through a small duct cated at the center of the water exhaust port. wo or more separators may be connected in se- es for applications in which a ship's ballast or lge water is separated into a first component ntaining primarily oil which can be stored in a nall volume, and a second component of sub- antially pure water which may be dumped over- oard. A baffle plate may be added in the chamber improve the separation process. This patent ntains subject matter related to patent no. 780,865. (See W74-05893) (Sinha-OEIS)
74-05894

IETHOD FOR SEPARATING OIL FROM A IIXTURE OF OIL AND WASTE WATER ROM AN OFFSHORE RIG,
.J. Carmichael, and A. G. Franklin.
.S. Patent No. 3,781,201, 1 p, 2 fig, 10 ref; Offi- al Gazette of the United States Patent Office, ol 917, No 4, p 1415, December 25, 1973.

escriptors: *Patents, Gypsum, Lime, *Oil pollu- on, *Pollution abatement, *Offshore platforms, ater pollution control, Water quality control, Separation techniques.

he method of separating oil from a mixture of oil id waste water from an offshore rig comprises of troducing the oil water mixture to a primary immer tank where oil that quickly separates om the water is skimmed off into a blow case. ater is introduced from the bottom of the prima- skimmer tank into a mixing tank where a mix- re consisting essentially of gypsum and lime is troduced into the mixing tank. Thereafter the psum-oil, excess gypsum and other solids are echanically separated from the water and the ean water is discharged overboard. (Sinha-OEIS)
74-05897

ONVERTIBLE BARRIER FOR SUBSTANCES LOATING ON WATER,
. Preus, and J. J. Gallagher.
.S. Patent No. 3,783,621, 3 p, 7 fig, 4 ref; Official azette of the United States Patent Office, Vol 18, No 2, p 577, January 8, 1974.

escriptors: *Patents, *Oil spills, *Oil pollution, quipment, *Pollution abatement, Water quality ontrol, Water pollution control, Separation chniques.

barrier adapts to contain oil slicks under any ater condition. It consists of liquid pervious and quid impervious skirts. The liquid impervious kirt is deflected at currents greater than about one not and the oily substances are treated with a par- culate oleophilic hydrophobic substance less ense than water for retention by the liquid pervi- us skirt. The barrier comprises a flotation collar ith the skirts depending from it in parallel-planar, extensive relationship. The flotation collar may e an inflatable tube or it may be made of a flota- le material such as polystyrene or polyethylene am, or an oleophic-hydrophobic material. inha-OEIS)
74-05902

ZONATING APPARATUS FOR DRINKING ATER,
loody Aquamatic Systems, Inc., Meadville, Pa. ssignee).
or primary bibliographic entry see Field 5F.
74-05904

IETHOD AND SYSTEM FOR THE CONTAIN- IENT AND SALVAGE OF CHEMICALS AND ILS AT SEA,
. L. Gambel.
.S. Patent No 3,783,622, 7 p, 8 fig, 8 ref; Official azette of the United States Patent Office, Vol 18, No 2, p 577, January 8, 1974.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Chemical wastes, Barriers, *Pollution abatement, Water quality control, Water pollution control, Equipment, Separation techniques.

Rigid barrier units are deployed around a surface area of a body of water which is to be enclosed in order to contain an oil spill or a chemical contaminant. Each unit is provided with adjustable buoyancy and ballasting chambers so that a nearly neutral buoyancy condition can be established. A substantial mass of the unit rests below the turbulence level of the water. The units are linked by hinge sections positioned at the ends of each unit and are mounted to move relative to their respective barrier units about horizontal axes that are perpindicular to the main longitudinal axis of the barrier unit. Hinge sections can be coupled to provide for pivotal movement about a common vertical axes. (Sinha-OEIS)
W74-05908

THE PHYSICAL SETTING OF THE COLORADO RIVER BASIN,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 4A.
W74-05921

OPTIMAL PLANNING FOR A THERMAL DISCHARGE TREATMENT SYSTEM,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 5D.
W74-05933

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, FOURTH VOLUME.
Office of Water Resources Research, Washington, D.C.
Available from the National Technical Information Service as PB-229 894, $9.75 in paper copy, $1.45 in microfiche. Water Resources Scientific Information Center, Report WRSIC 73-218, December 1973. 490 p, 323 ref.

Descriptors: *Systems analysis, *Bibliographies, Water resources, *Optimization, *Simulation analysis, Operations research, Abstracts, Alternative planning, *Management, *Planning, Evaluation.

An annotated bibliography containing 323 abstracts is presented of selected publications issued in 1971 and 1972 pertaining to the application of systems analysis techniques for defining and evaluating alternative solutions to water resource problems. The first two volumes of this bibliography, having the same title, were published by the Cornell University Water Resources and Marine Sciences Center, Ithaca, New York (Publication 25, August 1969; Publication 35, June 1971); the third volume was published by the Water Resources Scientific Information Center in December 1972. Both subject and author indexes are provided. Descriptors are listed with each abstract. The abstracted material emphasizes the application of optimization and simulation techniques for assisting in the planning and management of water resource systems.
W74-05401

EXTENDED PERIOD SIMULATION OF WATER DISTRIBUTION NETWORKS,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4A.
W74-05533

POPULATION GROWTH, RESOURCE AVAILABILITY AND ENVIRONMENTAL QUALITY,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 6B.
W74-05614

AN OPERATIONAL MATHEMATICAL PROGRAMMING MODEL FOR THE PLANNING OF ECONOMIC ACTIVITIES IN RELATION TO THE ENVIRONMENT,
Netherlands School of Economics, Rotterdam. Economic Research Inst.
For primary bibliographic entry see Field 6B.
W74-05616

APPLICATION OF MICROECONOMIC MODELS TO REGIONAL ENVIRONMENTAL QUALITY MANAGEMENT,
Resources for the Future, Inc., Washington, D. C.
C. S. Russell.
American Economic Review, Vol 63, No 2, p 236-243, 1973. 22 ref.

Descriptors: *Model studies, *Environmental effects, *Decision making, Costs, Economic impact, Environmental control, Standards, Regional analysis, Mathematical models.
Identifiers: *Microeconomic models, Ambient quality standards, Steepest ascent method.

Microeconomic models presently used to examine environmental quality problems generally concentrate on the costs of reducing or modifying discharges. Such models are designed to find the most efficient way of meeting exogenously given standards for either discharges or ambient quality. The choice between the two is the result of potential policy choices of the public agency, number of sources for which discharge reduction cost function need be developed, and the complexity of the environmental model used. Models currently being developed at Resources for the Future (RFF) are similar to earlier models that were subject to ambient standards. These RFF models are divided conceptually into three parts: one dealing with discharge, production and consumption activities; a second transforming discharges into ambient conditions; and a third, comparing ambient conditions to standards or entering them into damage functions. RFF models are distinguishable from classical forms as they deal with all waste forms and their interactions simultaneously. Activities are also extremely flexible, allowing non-constant cost and input and process substitutions. Information is also generated on the distribution of impacts from potential environmental management decisions. Solutions are found in newly developed RFF models using essentially the steepest ascent method, found primarily in non-linear programming. (Schroeder-Wisconsin)
W74-05627

ALTERNATIVE WATER RESOURCE SYSTEMS IN THE LOWER MEKONG,
Economic Commission for Asia and the Far East (UN), Bangkok (Thailand).
K. Chaemsaithong, L. Duckstein, and C. C. Kisiel.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY3, Paper 10430, p 461-475, March 1974. 3 fig, 2 tab, 28 ref.

Descriptors: *Water resources development, *River basin development, *Asia, Cost-benefit analysis, Economics, Hydroelectric power, Flood control, Mathematical models, Optimization, *Alternative planning.
Identifiers: *Lower Mekong Basin.

A systematic method is given for evaluation of alternative water resources systems with particular reference to the development of water resources in the Lower Mekong Basin. In the evaluation process, the development goals that may be of an

economic or social nature are explicitly stated and transformed into specifications. The approach requires that distinct alternatives be sought and compared using both quantitative and qualitative criteria. A decision to select an alternative can be reached by use of a fixed-cost or fixed-effectiveness approach. Sensitivity analysis in the approach takes into account uncertainty in hydrologic and economic data. (Knapp-USGS)
W74-05733

MASTER PLANNING METHODOLOGY FOR URBAN DRAINAGE,
Rice (Leonard) Consulting Water Engineers, Denver, Colo.
H. F. Bishop.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY1, Paper 10290, p 189-199, January, 1974. 4 fig, 12 ref.

Descriptors: *Planning, *Urban hydrology, *Urban runoff, *Water reuse, Data collections, Data processing, Urban drainage, *Flood control, Systems analysis, Water management(Applied), *Colorado.
Identifiers: *Denver(Colo).

Effective operation and maintenance of the urban environment requires the coordinated management of the various elements of the urban area. One of the principal elements of the urban system is that of water resource management which includes urban drainage and flood control. A systems engineering methodology was developed for master planning of the major drainage system in the Denver area under Project REUSE (Renewing the Environment through Urban Systems Engineering). The methodology incorporates a functional description of the urban drainage system and a systematic process of data acquisition, runoff analysis, concept identification and selection, and master plan development and implementation. (Knapp-USGS)
W74-05834

INTERREGIONAL PLANNING OF WATER RESOURCES ALLOCATIONS BY SYSTEMS ANALYSIS APPROACH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4A.
W74-05932

OPTIMAL PLANNING FOR A THERMAL DISCHARGE TREATMENT SYSTEM,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 5D.
W74-05933

OPTIMUM RESERVOIR OPERATING POLICIES AND THE IMPOSITION OF A RELIABILITY CONSTRAINT,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-05934

A USEFUL THEOREM IN THE DYNAMIC PROGRAMMING SOLUTION OF SEQUENCING AND SCHEDULING PROBLEMS OCCURRING IN CAPITAL EXPENDITURE PLANNING,
Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering and Management Sciences.
For primary bibliographic entry see Field 6B.
W74-05935

MULTIPLE-OBJECTIVE OPTIMIZATION IN WATER RESOURCE SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Electrical Engineering.
V. Vemuri.
Water Resources Research, Vol 10, No 1, p 44-48, February 1974. 2 fig, 1 tab, 8 ref.

Descriptors: Water resources, *Planning, *Management, *Optimization, *Methodology, Equations, Reservoir storage, Reservoir releases, Mathematical models, Systems analysis.
Identifiers: *Multiple-objective optimization, *Noninferior solutions, Auxiliary scalar optimization.

Multiple-objective optimization problems arise naturally in resource management projects. A chief difficulty with multiple-objective optimization is that it is no longer clear what one means by an optimal solution. A possible remedy to this situation is to refine the concept of 'optimal solution' by introducing the so-called 'noninferior solution set.' Then optimization, in a multiple-objective context, boils down to determining the set of noninferior solutions. Determination of the noninferior set is facilitated by relating it, in a one-to-one manner, to a family of auxiliary scalar optimization problems. For a certain class of problems the entire noninferior set can be obtained by solving the auxiliary scalar problem. This procedure is illustrated, considering the problem of determining the optimum storage capacity of a reservoir subject to a specified set of release rules. For demonstration purposes, some simplifications are made. The applicability of this method is presently restricted to the use of a particular functional form for each vector index and no constraints. Further research is needed to extend this method to more general forms of performance indices and to problems in which decision and state variable constraints are present. (Bell-Cornell)
W74-05936

OPTIMAL DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS,
Thomas J. Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 4A.
W74-05937

MODELING THE REGULATION OF LAKE SUPERIOR UNDER UNCERTAINTY OF FUTURE WATER SUPPLIES,
Sun Oil Co., Dallas, Tex.
For primary bibliographic entry see Field 4A.
W74-05938

6B. Evaluation Process

WATER ALLOCATION MODELS BASED ON AN ANALYSIS FOR THE KISSIMMEE RIVER BASIN,
Florida Univ., Gainesville. Dept. of Food and Resource Economics.
J. E. Reynolds, J. R. Conner, K. C. Gibbs, and C. F. Kiker.
Available from the National Technical Information Service as PB-229 636, $5.00 in paper copy, $1.45 in microfiche. Florida Water Resources Research Center, Gainesville, Publication No. 26, 1973. 147 p, 19 fig, 22 tab, 36 ref, 3 append. OWRR B-005-FLA(4), OWRR B-007-FLA(12). 14-31-0001-3069, 14-31-0001-3267.

Descriptors: *Water allocation(Policy), Water values, Water utilization, Water demand, Decision making, Model studies, *Simulation analysis, *Florida, *Water distribution(Applied), *Alternative water use, Linear programming, *Mathematical models, Water policy, Operations.
Identifiers: Water allocation models, *Kissimmee River basin(Fla), *Operational policy.

Two types of models for allocating water among alternative uses and between watersheds in the Kissimmee River Basin were developed and empirically evaluated. The value of water in agricultural and recreational uses was estimated for use in the allocation models. A linear programming model of the hydrologic-economic system was developed to determine the economic consequences of broad operational policy alternatives and the relative trade-offs based on economic returns from water allocation among different uses, locations and time periods. A simulation model that incorporated hydrologic and physical relationships for the basin was evaluated as an alternative type of water allocation model. The two different types of water management models evaluated in this study can serve different purposes. The simulation model, because of its detailed approach, is best suited for developing and evaluating specific operational policies for individual basins. The linear programming model is better suited for assessing effects of broad operational policy alternatives and for determining optional choices. This study demonstrated the feasibility and usefulness of water management system modelling as a means of providing information for selecting water management policy alternatives. (Morgan-Florida)
W74-05402

AN ANALYTICAL INTERDISCIPLINARY EVALUATION OF THE UTILIZATION OF THE WATER RESOURCES OF THE RIO GRANDE IN NEW MEXICO: MIDDLE RIO GRANDE REGION,
New Mexico State Univ., University Park. Dept. of Agricultural Economics.
R. R. Lansford, S. Ben-David, T. G. Gebhard, Jr., W. Brutsaert, and B. J. Creel.
Available from the National Technical Information Service as PB-229 671, $4.50 in paper copy, $1.45 in microfiche. New Mexico Water Resources Research Institute Report No. 022, Partial Technical Completion Report, 1973. 99 p, 14 fig, 36 tab, 1 append, 67 ref. OWRR A-045-NMEX(3).

Descriptors: *New Mexico, Water resources, *Water demand, Economics, *Alternative water use, *Water resources development, *Management, *Economic prediction, *Surface-groundwater relationships, Natural resources, Water requirements, Resource allocation, River basins, Groundwater management, Water law, Interstate compacts, International compacts, Treaties, Litigation, Water quality, *Water utilization, Human population, Employment, Industrial water, Recreation, Water management(Applied), Linear programming, *Rio Grande River.
Identifiers: *Socioeconomic models, Groundwater appropriation, Input-output coefficients, Surface-groundwater conjunctive use model, Economic land classification, Groundwater models, Irrigation water diversions.

An interdisciplinary approach to the solution of the water resource problems of the Middle Rio Grande Region in New Mexico was centered around a socio-economic model, with special emphasis placed upon the Rio Grande Region. Inputs into the socio-economic model were obtained from separate studies. Three sets of alternatives were considered: (1) Without a water constraint, in the Rio Grande Region, both production and depletions are expected to exhibit the largest increase (59.7 percent and 47.4 percent, respectively); (2) When a surface water constraint is imposed, the value of production is reduced by $18.1 million in 2020 and water depletions are expected to decrease about 18.1 percent by 2020; (3) When a total water constraint is imposed, the value of production is decreased $4.1 million below that expected when using only a surface water constraint, and water depletions reduced about 8.4 percent. The Middle Rio Grande Region is expected to follow the general trend of the total Rio Grande region but at a higher growth rate. The expected increase in total value of production from 1970 to 2020 is 62.0 percent, employment 62 percent, and water depletions about 61 percent. When a surface-water constraint is imposed, production is expected to be reduced $3.2 million in 2020, employment by 154 employees, and water depletions by 51,633 acre-feet. When an additional constraint is imposed on ground water in the MRGR, produc-

on would be decreased $2.0 million in 2020, employment by an additional 99 employees, and water depletions by 38,390 acre-feet. (Hain-New Mexico)
W74-05408

NEW DIRECTIONS IN U.S. WATER POLICY--SUMMARY, CONCLUSIONS AND RECOMMENDATIONS FROM THE FINAL REPORT OF THE NATIONAL WATER COMMISSION.
National Water Commission, Arlington, Va.
Available from GPO, Washington, D.C. 20402 Price $2.50. Summary of National Water Commission Final Report to the President, House of Representatives and Senate, 1973. 197 p, 4 append.

Descriptors: *National Water Commission, Water resources development, *Water law, Governments, Water policy, Water transfer, Economics, Water costs, Water utilization.

The National Water Commission, created by Act of Congress in 1968 to review national water resources problems, submitted its report and recommendations to the President and the Congress on June 15, 1973. Because the full report is a document of nearly 600 pages, a summary is presented for those who do not wish to take the time to read the complete report. Water is one of many resources that must be managed prudently for the national good. Prudent management requires the pursuit of sound economic policies to increase national wealth and of wise environmental policies which promote the health and happiness of the people and protect the life-supporting ecological systems of the earth. Institutions and procedures must be adequate to the task of identifying policy questions, of analyzing the issues on an information base broad enough to predict results, and then of making decisions. The legal system must provide the means of implementing policy decisions while protecting the rights of individuals. In particular, there is need to modernize laws dealing with groundwater. Up until very recently insufficient attention has been given regulation of groundwater as part of the total water resource, and as something which should be closely coordinated with regulation of surface waters. Not only is groundwater a major source of water supply for agriculture, industry, and municipalities, it is susceptible to pollution which can be even more serious than pollution of surface waters. Development, management, and protection of water resources should be controlled by that level of government nearest the problem and most capable of effectively representing the vital interests involved. Regional and State entities, as well as local units of government, should assume increasing roles in the control of water resources use and preservation. (See also W73-12052) (Knapp-USGS)
W74-05522

MEASURING THE INTANGIBLE VALUES OF NATURAL STREAMS, PART II, PREFERENCE STUDIES AND COMPLETION REPORT,
Kentucky Water Resources Inst., Lexington.
J. A. Dearinger, G. M. Woolwine, C. R. Scroggin, D. R. Dolan, and J. S. Calvin.
Available from the National Technical Information Service as PB-229 838; $14.00 in paper copy, $1.45 in microfiche. Research Report No. 66, December 1973. 207 p, 52 fig, 15 tab, 10 append. OWRR B-015-KY(2). 14-31-001-3086.

Descriptors: *Aesthetics, Psychological aspects, Scenery, Value, *Intangible benefits, Intangible costs, Conservation, Environmental effects, Recreation, Regional analysis, Planning, *Kentucky, Attitudes, *Motivation, *Behavior, Regression analysis, Evaluation, Wild rivers, *Natural streams.
Identifiers: *Psychometric analysis, Uniqueness concept, Scenic rivers.

This report describes the work done during Part II of a project which had as its aim the development of a way to quantify those intangible values peculiar to a small stream and its watershed. Part I was concerned with an application of the 'uniqueness concept' in the evaluation of a fifty-eight Kentucky streams. The results of this effort are in Report Number 40, U.K. Water Resources Institute (1971), (See W71-11859). During the second part of the project: (1) A method was developed whereby peoples' preferences for natural landscapes could be measured. The method utilized projected color slides and a rating system based on the semantic differential. (2) Fourteen preference studies were conducted using different types of subjects and stimuli (color slides). (3) The data were factor analyzed and scores computed for three factors (Natural Beauty, Force and Starkness) for each slide-subject group combination. (4) The scenic content of each slide was measured and related to the factor scores by a series of linear regression equations. (5) The uniqueness ratio approach was modified to include fewer stream characteristics (thirty-seven) and the work of Part I essentially repeated. (6) A new method of stream evaluation was developed which yields a factor score for a given stream on each of six factors (Scenic Attractiveness, Land Use-Topo, Litter, Aquatic Habitat, Extractive Industry, Development). (Grieves-Kentucky)
W74-05538

THE COLUMBIA RIVER TREATRY: THE ECONOMICS OF AN INTERNATIONAL RIVER BASIN DEVELOPMENT,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-05585

LEGISLATIVE FRAMEWORK FOR WATER RESOURCES MANAGEMENT IN ALABAMA.
Alabama Univ., University. Natural Resources Center.
For primary bibliographic entry see Field 6E.
W74-05590

POPULATION GROWTH, RESOURCE AVAILABILITY AND ENVIRONMENTAL QUALITY,
Resources for the Future, Inc., Washington, D.C.
J. L. Fisher, and R. G. Ridker.
American Economic Review, Vol 63, No 2, p 79-89, May 1973. 1 fig, 2 ref.

Descriptors: *Population, Environment, Natural resources, Technology, *Resource allocation, Model studies, *Mathematical model, Regulation, Decision making, Planning, *Pollution abatement, Social aspects, Gross National Product.
Identifiers: *Environmental quality, *Economic growth, Raw materials, Population growth, Birth control, Resource availability.

The interrelationships of population, resources, and environment are examined in order that more coherent industrial and governmental policies might be formulated to meet environmental problems. Use of a mathematical model of the economy together with a comparison of model results with conventional studies of specific sectors such as agriculture and energy led to the conclusion that the United States is not likely to experience serious shortages of raw materials during the next 30 to 50 years as a result of projected population and economic growth. Population growth becomes more important as the time framework increases, but in the short term, technology, consumer tastes, and public policies have a more important impact on resources and the environment. Direct attacks on pollution problems through an active pollution abatement policy easily dominates over reductions in population and economic growth as a means of obtaining a cleaner environment. Critical elements for any understanding of the population, resources and environment interrelationship include the time horizon of the analysis, the geographic area under consideration, the technological, behavioral and institutional setting, and the composition of production and consumption. The importance of continuously monitoring the interrelationship is shown and a number of the more significant policy directions are noted. (Slattery-Wisconsin)
W74-05614

AN OPERATIONAL MATHEMATICAL PROGRAMMING MODEL FOR THE PLANNING OF ECONOMIC ACTIVITIES IN RELATION TO THE ENVIRONMENT,
Netherlands School of Economics, Rotterdam. Economic Research Inst.
F. Muller.
Socio-economic Planning Sciences, Vol 7, No 2, p 123-137, 1973.

Descriptors: *Environmental effects, *Industrial production, *Mathematical models, *Economic impact, Linear programming, Economic justification, Social impact, Regional economics, Industrial wastes, Input-output analysis, Diffusion, Constraints, Pollution abatement, Investment, National income, Welfare(Economics), Decision making.
Identifiers: *Environmental quality.

Three models are developed to illustrate the effects of increased production on the environment. These models have in common an input-output submodel which relates inputs, outputs, final demand and pollution emissions. Emissions are dispersed throughout the region using a diffusion submodel. This submodel provides decision makers with the impacts of production decisions on any regional sector's environmental quality. In models one and two, the region's contribution to the national income is maximized, subject to any sector's available labor supply and minimum productions standards, using linear programming. The second model limits the concentration of each pollutant within every sector. Duals, which yield the marginal benefits gain from the relaxation of environmental constraints, are ranked and compared with the investment costs necessary to reduce emissions. Model three possesses a non-linear objective function, constraints, and explicitly considers the changes in investments. A step-wise method is developed to solve this problem. All models allow a number of pollution abatement practices to be incorporated including changes in production levels, production processes, input substitutions, locational changes, abatement investment and recycling. Input-output, pollution and diffusion data are necessary to operate each model. (Schroeder-Wisconsin)
W74-05616

ENVIRONMENTAL IMPACT AND WATER DEVELOPMENT,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 6G.
W74-05619

COMPETING VALUES IN WATER DEVELOPMENT,
Committee on Interior and Insular Affairs (U. S. Senate). Subcommittee on Water and Power Resources.
D. A. Dreyfus.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 99, No HY9, p 1599-1604, 1973. 4 ref.

Descriptors: *Social values, *Social participation, *Future planning(Projected), Division making, Resources development, Water resources, Environment, Attitudes, Alternative planning.
Identifiers: *Resource management.

Nowhere else in the United States' public sector have changing societal values been as pronounced as in the rejection of existing resource management concepts. These value changes have been exacerbated by the exponential growth of the American economy and the growing environmental movement, a growth which has forced a number of critical resource management decisions. Previously resource managers have applied the utility concept to planning by extrapolating basic indicators, such as GNP, into the future then mechanically converting these into the demand for products and services. The projected need is considered a justification and mandate for action and plans are made to fulfill such projections. Critics of this approach contend that projected increased demands are not inevitable, not do they reflect public choice; indeed such projection may induce self-fulfilling prophesies. Even when the needs are real, the utility approach fails to consider alternative management plans which may have less objectionable side effects. An alternative management strategy would utilize a desired rather than projected future and alternative plans would be ranked according to their ability to meet desired outcomes. The discovery of desired futures would imply greater citizen participation which in itself may make the public sector responsive to evolving social values. (Schroeder-Wisconsin)
W74-05620

PARKLAND PLANNING AND LAKE MANAGEMENT IN THE ROCK RIVER BASIN.
Wisconsin Univ., Madison. Inst. for Environmental Studies.
IES Report 14, November 1973. 49 p, 2 fig, 1 tab, 41 ref.

Descriptors: *Recreation, *Parks, *Comprehensive planning, Lakes, Rehabilitation, Watershed(Basins), *Wisconsin, Decision making, Community development, Urbanization, Institutions, Financing, Land use, *Management, Reclamation, Carp, Riprap, Zoning, *Regional analysis.
Identifiers: Jefferson County(Wis.), Lake Koshkonong(Wis.), *Rock River basin(Wis.), *Environmental Impact Statements.

Actual resource management problems within the context of local or regional planning and administration considers Lake Koshkonong, Wisconsin improvement and its problems and possibilities, together with development of Jefferson County recreation parklands. After reviewing the problems and proposed alternatives in Lake Koshkonong, only the riprap program and improved zoning action is endorsed at this time. The study of parkland planning and development policy in Jefferson County, Wisconsin considers how much parkland is needed and what are the appropriate acreage and activity standards; who should pay for the acquisition, development, and maintenance of the county park system; to what extent should new park areas be developed; what land classifications should and should not be used for recreation; and whether stronger recreational regulatory authorities and expanded administrative investments are needed to maintain quality parkland and recreational facilities. State and federal ligislation and procedures available to counties for making environmental impact assessments are outlined. Guidelines for preparing and reviewing environmental impact statements are provided and suggestions are given for raising environmental questions in local project planning even when environmental impact statements are not formally required, with examples based on Jefferson County. (Jones-Wiscosi
W74-05624

75 WATER ASSESSMENT. DRAFT PLAN OF STUDY.
Water Resources Council, Washington, D. C.
July 1973. 52 p, 6 fig, 2 tab.

Descriptors: *Water supply, *United States, *Assessment, Water demand, *Evaluation, Water resources, *Planning.
Identifiers: Water Resources Council, 1975 water assessment, Study plan.

The plan for the assessment of the nation's water supplies by the Water Resources Council is prepared in order to identify existing and emerging water and related resource problems, judge their severity and their urgency for resolution by various governmental actions. The assessment format is carefully described. The initial step is the development of a range of potential water requirements based on a set of regional and national projections of economic activities (OBERS). Next, an evaluation is made of imbalances between current (1975) water supplies and future requirements. Two separate studies will be conducted: the first analyzes the problem on a national basis, the second to pinpoint specific problem areas not covered in the national study. Information gathered in this second step will be compiled to show the economic, social, and environmental impacts of projected deficiencies. Using this information for Step 3, the National Programs and Assessment Committee and regional sponsors' selected judges will rank the severity of these deficiencies according to a consistent set of criteria to be developed. Ranking will be shown in a draft report soliciting public response. Step 4 recommendations will involve identifying problems having the greatest national interest and suggesting appropriate future federal roles. (Schroeder-Wisconsin)
W74-05626

THE PROCEEDINGS OF A NATIONAL SYMPOSIUM ON COSTS OF WATER POLLUTION CONTROL.
North Carolina Research Triangle Universities, Raleigh; and Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05629

ECONOMIC IMPLICATIONS OF ALTERNATIVE NATIONAL POLICIES FOR WATER POLLUTION CONTROL,
Environmental Protection Agency, Washington, D.C. Planning and Evaluation Branch.
For primary bibliographic entry see Field 5G.
W74-05630

ECONOMIC IMPLICATIONS OF ALTERNATIVE NATIONAL GOALS,
National Wildlife Federation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W74-05631

COST EFFECTIVENESS OF CURRENT ENVIRONMENTAL ENGINEERING PRACTICES,
Camp, Dresser McKee, Boston, Mass.
For primary bibliographic entry see Field 5G.
W74-05633

POLLUTION CONTROL POLICY AND THE EFFICIENT ALLOCATION OF RESOURCES,
Council of Economic Advisors, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05637

BENEFIT-RELATED EXPENDITURES FOR INDUSTRIAL WASTE TREATMENT,
Syracuse Univ., N.Y. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-05641

AQUACULTURE: ECONOMIC FEASIBILITY IN THE GREAT LAKES AREA,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
W. D. Dobson.
In: Proceedings of Fourth National Sea Gran Conference, October 12-13, 1971, Madison Wisconsin, 1225 West Dayton Street, Sea Gran Program, University of Wisconsin, Madison, p 89 98. 3 tab, 15 ref.

Descriptors: *Aquiculture, *Fish, *Great Lakes *Economic feasibility, Water pollution, Effluents Catfishes, Perches, Trout, Shrimp, Thermal pollu tion, Pikes, Powerplants, Demand, Marketing.
Identifiers: Japan, Great Britain, Chub, Advertis ing.

Despite its economic potential to Great Lakes are processors, capital will not flow into aquacultur until certain economic and technical problems ca be solved. One primary problem is to keep wate heating costs down. Problems such as lack o available research information, supply of brood stock, and availability of low cost credit, could b solved through a program of public assistance t aquaculture growers. While aquaculturall produced fish will be easier to market an merchandise than wild fish, the demand for fis may grow slowly unless a strong advertising an promotional program is implemented. Currently i the planning or experimental stage is the use o thermal discharges for aquaculture. Included ar several catfish raising experiments in the Unite States, as well as shrimp and yellowtail experi ments in Japan, and successful experimental worl in Great Britain. While problems exist in the use o thermal discharge for fish raising, experimental in formation suggests that economically viabl systems of this type might be developed. A viabl aquacultural industry, which would includ adequate demand for fish products, could aid th continued economic growth of the Great Lakes re gion. (See also W74-05644) (Pinsky-Wisconsin)
W74-05648

COMPATIBILITY OF PETROLEUM ACTIVITIES IN THE COASTAL ZONE,
Humble Oil and Refining Co., Houston, Tex.
J. R. Jackson, Jr.
In: Proceedings of the 24th Annual Session Gul and Caribbean Fisheries Institute, Novembe 1971, Rosenstiel School of Marine and At mospheric Science, University of Miami, Cora Gables, Florida, p 48-55, 1972. 7 fig.

Descriptors: *Water resources development, *Oi industry, *Coasts, Natural resources, Optima development plans, Compatibility, Tourism, Fish ing, Gulf of Mexico.
Identifiers: *Coastal Zone management.

The relation between oil consumption and GNI and regional economic development is presente as evidence of the strategic importance of the oi industry in maintaining our current standard of liv ing and its future improvement. The compatibilit of oil resources development and other coasta resources such as fish and recreation is described It is pointed out that diverse activities can coexis in harmony if the concept of compatible use is ap plied in their management. The compatible us concept is a flexible framework of use priorities ir which long-term social and economic benefits ar maximized. If one use is paramount, other use should be permitted to the extent that they do no interfere with the dominant use. Possible un reasonable interferences are considered an shown to be insignificant. (See also W74-05651 (Weaver-Wisconsin)
W74-05656

AREA-OF-ORIGIN PROTECTIONISM IN WESTERN WATERS,
Department of the Environment, Ottawa (Ontario). Water Planning and Management Branch.
F. J. Quinn.
Inland Waters Directorate, Social Science Series No 6, 1973. 95 p, 12 fig, 15 tab. 248 ref.

escriptors: *Inter-basin transfers, Water sources development, Political aspects, olitical constraints, *Canada, Social aspects, nvironment, Governments, *Water law, Conser-tion, *Institutional constraints.
entifiers: *Protectionism(Area of origin).

ublic interest has focused so completely on oposals for inter-regional and international ter diversion, few have noticed the effective position to them put forth by those areas with e most to lose. No area of streamflow origin in e North American West has ever parted willingly th its water. Area-of-origin motivations, past ccesses in state statutes and interstate com-cts, strategies employed in and out of Congress, d prospects in the continuing struggle are scussed. No better example of protectionist ategy exists than that of the Pacific Northwest ates in successfully opposing legislation provid-g for studies of means to augment the water sup-ies of the Colorado Basin. The two-pronged ef-rt of Northwestern leaders--to reorganize and ose divisions in their own ranks at home while king advantage of national sentiment for conser-tion and comprehensive planning to counteract version proposals in Congress--is followed in tail. Federal and provincial jurisidctions in nada are explored. Analogies with the sale of her Canadian resources across the international rder are found not to be very relevant, given the onger environmental context of water. (Knapp-SGS)
74-05854

REVIEW OF WASTEWATER PROBLEMS ND WASTEWATER MANAGEMENT LANNING IN THE SAN FRANCISCO BAY RE-ION, CALIFORNIA.,
eological Survey, Menlo Park, Calif. Water esources Div.
or primary bibliographic entry see Field 5D.
74-05863

HE MANAGEMENT OF WATER IN EN-LAND AND WALES: THE CASE FOR EFORM,
epartment of the Environment, London ngland).
E. Beddoe.
own and Country Planning, Vol 40, No 9, p 405-1, September, 1972. 2 fig.

escriptors: *River basin commissions, *Water anagement(Applied), Water resources, *Water ilization, Water supply, Water demand, Water nservation, Water quality, Rivers, Environmen-l control, Sewage disposal, Sewage treatment, aste water treatment, Water pollution control.
entifiers: *Regional water authorities(Gr. itain), Central Advisory Water Committee(Gr. itain).

iver management and water services provision in reat Britain have developed in the last 100 years probably the best standards in the world. Effi-ent water management is essential since ex-oitable water is scarce, resources are heavily ed, rivers are small, and inland water exists in nall proportions. Studies predict future needs to uble present supplies. Rivers will be relied upon stead of just groundwater or water piped from land storage. Water quality, equally as impor-nt as quantity, links waste removal and new urce development into comprehensive manage-ent. In the past, water uses were separated, but e Trent Model Research Programme shows that treating rivers as a system, an optimal solution, cluding water treatment, sewage disposal, and ver management, is attained at lower cost than ith separated functions. The Central Advisory ater Committee reported comprehensive water anagement should exist for each river basin, to administered by multi-purpose authorities. Ten thorities will be established to provide water and claim or dispose of used water, considering navigation, recreation, drainage, defense, and conservation needs. A National Water Council is proposed to provide central water-related services. (Grden-North Carolina)
W74-05865

LAKE NORMAN DEVELOPMENTAL IMPACT STUDY,
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
R. J. Burby, III, T. G. Donnelly, and S. F. Weiss.
Prepared for Centralina Council of Governments and Lake Norman Marine Commission, June, 1972. 121 p, 3 fig, 25 tab, 3 append.

Descriptors: *Lakes, *Recreation facilities, *Comprehensive planning, *Urbanization, Shore protection, Non-structural alternatives, Water pollution, *Land use, *North Carolina.
Identifiers: *Lake Norman(N.C.), Residential development, Participation rates.

Lake Norman in the Central Piedmont area of North Carolina has been a major recreational and residential resource since its creation in 1963. While present development is scattered, much of the shoreline has been committed to future intensive residential, commercial, and industrial use. The area will gradually shift from its presently rural environment to an increasingly urbanized one. Concomitant with this are the dangers of environmental degradation and the loss of recreational amenities. Problems of residential and resource utilization of the lake are analyzed. The amount and location of residential growth between 1970 and 1981 are forecast. The recreation environment is examined in terms of potential demand until 1981 and involves discussion of market area population, participation rates, and the relative accessibility of Lake Norman. An inventory and evaluation of existing recreational facilities and a projection of additional facilities needed by 1981, and identification of potential problems and conflict situations stemming from both residential and recreational uses are presented. Potential problems include water pollution, solid waste disposal, public access, residential quality, public safety, and conflicting water surface uses. Recommendations for policies and actions to maintain environmental quality and enhance recreational opportunities are: (1) develop a comprehensive land use plan; (2) preserve open space and land for public recreation; (3) promote compact development; (4) alleviate the threat of lake pollution; (5) improve the quality of development; (6) control litter and unauthorized dumping; (7) control vandalism and theft; and (8) control power transmission line routes. (Hoffman-North Carolina)
W74-05869

SHAWNEE COMPREHENSIVE PLAN, WATER WORKS SYSTEM AND SANITARY SEWERAGE SYSTEM,
Benham-Blair and Affiliates, Inc., Oklahoma City.
For primary bibliographic entry see Field 5D.
W74-05871

THE LAND WATER INTERFACE IN AN URBAN REGION: A SPATIAL AND TEMPORAL ANALYSIS OF THE NATURE AND SIGNIFICANCES OF CONFLICTS BETWEEN COASTAL USES,
Washington Univ., Seattle. Div. of Marine Resources.
P. Harrison.
Available from the National Technical Information Service as COM-73-11257; $5.25 in paper copy, $1.45 in microfiche. PhD Dissertation. 1973. 181 p, 20 tab, 8 fig, 157 ref. NOAA SG-1-72.

Descriptors: *Earth-water interfaces, Coasts, *Management, *Land use, *Urbanization, *Washington, Shores, Regional economics, Natural resources, Water utilization, Bodies of water, Environment, Model studies, Methodology.
Identifiers: *Puget Sound(Wash), *Coastal zone management, Sea Grant Program.

A framework for empirical analysis of changing coastline use in an urban area is provided. Growth of coastal activities is described, the role of common property resources in generating negative externalities is analyzed, and classifications developed are tested in the Puget Sound region of Washington. Coastal activities are divided into commercial and non-commercial sectors, and a shift to non-commercial activities in an advanced regional economy is hypothesized. Commercial activities produce a final demand good, and non-commercial activities are sites used by consumers, such as marinas. Twenty water-related activities are analyzed and result in support of the hypothesis. This shift is also relected in higher prices paid for shoreline location for non-commercial activities. The hypothesis that commercial activities generate competing coastal uses with negative effects felt by non-commercial activities is rejected, since non-commercial activities generate and receive a greater proportion of critical conflicts. Effects of land-use conflict upon regional political structure and spatial distribution of coastline activities are examined. For example, the shift to non-commercial activities, characterized by loosely coordinated groups, will probably result in more permanent groups to protect their interests. (Grden-North Carolina)
W74-05872

ENVIRONMENTAL QUALITY PLANNING - GOALS, POLICIES, AND OBJECTIVES.
East-West Gateway Coordinating Council, St. Louis, Mo.
Available from the National Technical Information Service as PB-222 097; $3.25 in paper copy, $1.45 in microfiche. Final Report. June, 1973. 18 p, 1 fig, 1 append. 3.8. Mo. P-198.

Descriptors: *Comprehensive planning, Environment, *Environmental effects, *Environmental control, Water policy, Water resources development, Land development, Land management, Land resources, Land use, Natural resources, *Missouri, Pollution, Air, Air environment, Air pollution, City planning.
Identifiers: *St. Louis(Missouri), *Environmental quality planning, Environmental goals, Environmental policies, Environmental objectives, Environmental protection.

Formation of environmental quality goals is the first phase of a comprehensive approach to environmental quality problems in the St. Louis, Missouri, region. Scope of environmental quality planning is delineated in the natural environment with systems of air, water, land, and plant and animal life which interact with each other and with man. Preliminary goals, policies, and objectives are established and are subject to continual refinement as programs progress. The general goal for environmental planning is a healthful, attractive, and ecologically sound environment which optimally supports the needs of citizens in the St. Louis region. Objectives include establishing a planning process, environmental enhancement and protection, and continuous evaluation. Water goals include regional water resources sufficient in quantity and quality to meet needs of the area and to support wildlife and to be used for human consumption. The goal for air resources is to reduce levels of air pollution in order to anticipate and prevent threats to human health and well-being. Development and use of land commensurate with the land's physical capabilities, and preservation of land in its natural state where possible, is the goal set for land use. (Grden-North Carolina)
W74-05876

A USEFUL THEOREM IN THE DYNAMIC PROGRAMMING SOLUTION OF SEQUENCING

AND SCHEDULING PROBLEMS OCCURRING IN CAPITAL EXPENDITURE PLANNING,
Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering and Management Sciences.
T. L. Morin, and A. M. O. Esogbue.
Water Resources Research, Vol 10, No 1, p 49-50, February 1974. 4 ref.

Descriptors: *Capital, *Expenditures, *Planning, *Theoretical analysis, Water resources, *Scheduling, *Dynamic programming, Optimization, Systems analysis, Mathematical models, Equations.

The management of capital expenditure planning continues to encounter problems that tempt the water resource planner to use complete enumeration, but the magnitude of such problems often defies the use of these direct methods. Direct transfer is neither feasible nor wise, and consequently, the establishment of a strong analytic base for this transfer is both necessary and useful. The dimensionality of certain sequencing and scheduling problems can be reduced by exploiting their special structures. An example of this type of reduction of dimensionality is presented in the form of a theorem. The use of the theorem in the dynamic programming solution of a previous example is discussed. Sufficient conditions for the optimality of a myopic decision rule are also shown to be a special case of the theorem. (Bell-Cornell)
W74-05935

MULTIPLE-OBJECTIVE OPTIMIZATION IN WATER RESOURCE SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 6A.
W74-05936

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

CONSERVATION OF WATER AND REDUCTION OF POLLUTION BY USE OF SOLVENT SYSTEMS FOR COLORING TEXTILE MATERIALS: AN ECONOMIC OUTLOOK,
Auburn Univ., Ala. Dept. of Textile Engineering.
For primary bibliographic entry see Field 3E.
W74-05535

ANALYSIS OF ECONOMIC IMPACTS OF ENVIRONMENTAL STANDARDS ON THE BAKERY INDUSTRY, PART I, EXECUTIVE SUMMARY.
Ernst and Ernst, Washington, D. C.
For primary bibliographic entry see Field 5G.
W74-05623

THE PROCEEDINGS OF A NATIONAL SYMPOSIUM ON COSTS OF WATER POLLUTION CONTROL.
North Carolina Research Triangle Universities, Raleigh; and Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05629

COST EFFECTIVENESS OF REGIONAL WASTEWATER SYSTEMS,
Environmental Protection Agency, Washington, D. C. Systems Application Section.
For primary bibliographic entry see Field 5D.
W74-05632

ECONOMIC GUIDELINES FOR ANALYSIS OF JOINT INDUSTRIAL-MUNICIPAL COLLECTION AND TREATMENT SYSTEMS,
Quirk, Lawler and Matusky Engineers, Tappan, N.Y.
For primary bibliographic entry see Field 5D.
W74-05634

EFFECTIVE POLLUTION CONTROL INVESTMENT,
Environmental Protection Agency, Washington, D.C. Div. of Municipal Waste Water Programs.
For primary bibliographic entry see Field 5D.
W74-05635

THE PRESENT AND FUTURE MARKET FOR POLLUTION CONTROL EQUIPMENT,
Business and Defense Services Administration, Washington, D.C. Water Resources and Engineering Services Div.; and Bureau of Domestic Commerce, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05636

ECONOMIC INCENTIVES IN WATER POLLUTION CONTROL,
Bowdoin Coll., Brunswick, Maine. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W74-05638

WATER AND WASTEWATER SURCHARGES AS ECONOMIC INCENTIVES,
North Carolina State Univ., Raleigh. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W74-05639

INDUSTRY VARIANCE OF CONSUMER PRICES AND COMPETITION AS A CONSEQUENCE OF WATER POLLUTION ABATEMENT,
Auburn Univ., Ala., School of Business.
For primary bibliographic entry see Field 5D.
W74-05640

COSTS OF WATER POLLUTION CONTROL IN THE CHEMICAL INDUSTRY,
Datagraphics, Inc., Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W74-05642

COSTS OF WATER POLLUTION CONTROL IN THE PAPER INDUSTRY,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W74-05643

ECONOMIC GROWTH VS. ENVIRONMENTAL PROTECTION: WHAT WILL BE THE OUTCOME,
Wisconsin Univ., Madison. Dept. of Economics; and Wisconsin Univ., Madison. Dept. of Agricultural Economics.
J. Steinhart, R. Lampman, and W. Lord.
Proc available from the National Technical Information Service as COM-73-10115, $3.00 in paper copy, $1.45 in microfiche. In: Proceedings: Fourth National Sea Grant Conference, University of Wisconsin, Madison, Sea Grant Publ. WIS-S6-72-112, p 49-60, October 1971.

Descriptors: *Pollution abatement, *Economic efficiency, Environmental control, Market value, Social values, Regulation, Decision making, Governments, Costs, Benefits.
Identifiers: *Externalities, *Economic growth, Price system.

Economists differ from ecologists in terms of their ultimate goals and the means to achieve these goals. Economic growth is the goal of the economist, and includes production of both commodities and services. The benefits of growth can be directed towards the ecologist's goal of improving and preserving the environment. However other claims, such as the elimination or reductio of poverty, the control of crime, and the elimina tion of discrimination, also exist for these sam benefits. Economists use the price system yieldin optimal amounts of pollution, in contrast to th policy of governmental regulation favored b ecologists. A major problem in utilizing the pric system in this manner, however, is the effects o externalities. Externalities are third party effect which are not adequately measured in the mark place. Thus a polluter does not feel the real cost o his actions. Public ownership and regulation, an assigning property rights to all aspects of th economy are suggested as ways of dealing with th issue. Future research ought to identify and evalu ate externalities, and get them into the decisio making process. Effluent charges, for exampl would give the social cost of pollution and allo polluters to measure this cost against the benefits. (See also W74-05645 thru W74-0565((Pinsky-Wisconsin)
W74-05644

ENERGY PRODUCTION AND ENVIRONMEN TAL CONSEQUENCES,
Office of Science and Technology, Washingtor D.C.
For primary bibliographic entry see Field 5C.
W74-05645

ECONOMICS OF AQUACULTURE DEVELOI MENT,
Hawaii Univ., Honolulu. Sea Grant Program.
J. R. Davison.
In: Proceedings of Fourth National Sea Grat Conference, October 12-13, 1971, Madisor Wisconsin, 1225 West Dayton Street, Sea Grat Program, University of Wisconsin, Madison, p 7. 82. 3 ref.

Descriptors: *Aquiculture, *Economics, Evalu. tion, Agriculture, Feasibility studies, *Cost *Profit, *Hawaii.
Identifiers: Sea Grant, Subsidies, Interdisciplina cooperation, Aquiculture development.

There is sufficient promise of benefits derive from aquiculture to justify not only present inves ment, but a massive effort to develop it. The ne work of services, money subsidies, and cost-pric controls which presently exist in agriculture, hav not yet been established for entrepreneu pioneering in aquiculture. While aid is now avail ble from the Sea Grant Advisory Service in twel states, there still is not the backlog of informatic or scientific manpower and skills that is availab to agriculture. This deficiency has slowed th development of aquiculture. However, progre could be accelerated by the combination of avail. ble skills in terrestrial animal and plant scienc with those who already understand the aquatic lif processes. Economists can contribute through th assessment of costs and returns, thus aiding th development of a viable, profit-making enterpris Projects which inject economic input into ongoir studies of aquiculture are currently being co ducted at the University of Hawaii. This type c cooperation is essential if aquiculture is to b raised to near its potential in several years rath than several generations. (See also W74-0564 (Pinsky-Wisconsin)
W74-05646

SOME REMARKS ON AQUACULTURE,
Hawaii Univ., Honolulu.
J. Bardach.
In: Proceedings of Fourth National Sea Grat Conference, October 12-13, 1971, Madisor Wisconsin, 1225 West Dayton Street, Sea Grat Program, University of Wisconson, Madison, 83-88. 1 tab.

Descriptors: *Aquiculture, *Model studie *Systems analysis, Research and developmen

eans, Agriculture, Water pollution, Economic
isibility.
entifiers: Sea Grant, Animal sciences, Joint pro-
ams.

hile the green revolution will result in increased
mpetition for aquaculture from animal protein,
growth in the world's population will severely
ain the capability of land areas to nourish man-
d. The extent to which ocean pollution can be
rbed will very much determine whether the
rld's protein needs can be supplied in part
ough aquaculture. Aquaculture must become
face intensive, highly automated, and of a luxu-
kind in order to compete effectively with ter-
trial animal protein. The phases which a species
st go through before they can be put into com-
itive aquacultural production include: (1) spe-
s selection, (2) biological research, (3) field tri-
, and (4) assessment of socio-economic factors.
nt industry-government aquacultural research
erations, as well as cooperative research by land
imal scientists and aquatic biologists, would be
eful. Such research should use system models in
der to determine the true potential of aquacul-
re and the means of achieving that potential.
ee also W74-05644) (Pinsky-Wisconsin)
74-05647

**GAL-ECONOMIC ASPECTS OF FISHERIES
SSION SUMMARY,**
uisiana State Univ., Baton Rouge. Law School.
r primary bibliographic entry see Field 6E.
74-05649

**APE: A COMPUTER MODEL FOR ALTER-
ATIVE SEWER SYSTEM COST EVALUA-
ON,**
uthwestern Pennsylvania Regional Planning
mmission, Pittsburgh.
r primary bibliographic entry see Field 5D.
74-05873

**ELIMINARY FEASIBILITY STUDY FOR
IE POJOAQUE VALLEY SEWERAGE
STEM.**
rthern Area Planning Organization, Sante Fe.,
Mex.
r primary bibliographic entry see Field 5D.
74-05875

**ATER SUPPLY AND WATER POLLUTION
ONTROL CAPITAL PROGRAM, 1972-1985.**
laware Valley Regional Planning Commission,
iladelphia, Pa.
r primary bibliographic entry see Field 5D.
74-05877

D. Water Demand

**ANALYTICAL INTERDISCIPLINARY
ALUATION OF THE UTILIZATION OF THE
ATER RESOURCES OF THE RIO GRANDE
NEW MEXICO: MIDDLE RIO GRANDE RE-
ON,**
w Mexico State Univ., University Park. Dept.
Agricultural Economics.
r primary bibliographic entry see Field 6B.
74-05408

**WATER ASSESSMENT. DRAFT PLAN OF
UDY.**
ater Resources Council, Washington, D. C.
r primary bibliographic entry see Field 6B.
74-05626

**ND USE TRENDS AND THE FUTURE OF
GRICULTURE IN THE NORTH ATLANTIC
GION,**
assachusetts Univ., Amherst. Dept. of Land-
ape Architecture.
E. H. Zube.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 2, p 232-234, 238, March-April, 1972. 10 ref.

Descriptors: *Land use, Land management, Land development, Rural areas, Urbanization, Zoning, *Reviews, *Agriculture, *Projections.
Identifiers: *Open land.

A literature review study shows that agricultural and 'open' land will decrease by as much as 50% by the year 2020 if present trends continue. An argument for land conservation and retention is also presented. (Skogerboe-Colorado State)
W74-05682

PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART I. NORTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.
N. M. Jackson, Jr.
North Carolina Office of Water and Air Resources, raleigh, July 1972. 277 p, 4 fig, 5 ref.

Descriptors: *Water supply, *North Carolina, *Hydrologic data, *Data collections, Water utilization, Water quality, Municipal water, Industrial water, Domestic water, Water resources development.

Information on the water resources and inventories of the public water supplies is compiled for 18 counties in the northern Piedmont section of North Carolina. The information should be useful to planners and water managers concerned with water-supply availability, water-resources development, and water quality. The method of investigation, the information reported for each water supply and its significance to planning, chemical analyses included in the report, and some of the problems noted during the investigation are discussed. A water-resources appraisal and a map of each county show the general area served by public water supplies and an inventory of each public supply in the county with 500 or more customers. The appraisal includes the population served, the adjacent communities served, the number of metered customers, the source of water, estimated allowable draft, total and industrial water use, raw and finished water storage, raw and finished water-pumping capacity, future plans, a water-resources appraisal in the immediate vicinity of the supply, and the results of chemical analyses of raw and finished water. (Knapp-USGS)
W74-05858

WATER SUPPLY PROBLEMS AND FUTURE RESOURCES,
Water Resources Board, London (England). Research Div.
P. G. O'Neill.
Town and Country Planning, Vol 40, No 9, p 412-418, September, 1972. 1 photo.

Descriptors: *Water sources, *Water utilization, *Water management(Applied), Water resources, Water demand, Water conservation, Water delivery, Water quality, Water requirements, Surface water availability, Groundwater, Reservoirs, Desalination, Estuaries, Water treatment, *Water reuse, *Waste water treatment.
Identifiers: *Metropolitan Water Board(Gr. Britain), London(England).

A shift from construction to management of water resources, plus a corresponding emphasis on water and effluent treatment rather than provision of additional water sources, is occurring in Britain. Traditionally, water supplies were derived from boreholes in aquifers, but groundwater levels fell for 150 years before the process was arrested. River water was used, but pollution necessitated development of reservoirs in upland valleys. Most reservoirs are of the direct-supply type, yet increased demand for water has led to treatment of water for reuse. Study concerning guidelines for operating sluices to maintain water flow but to provide maximum storage is progressing. The use of radar is feasible to predict rainfall affecting water supply. Other considerations in reservoir regulation include use of gravity or pumped inflows and ecological consequences of management. Another source, groundwater, usually biologically pure, could help maintain river flows in dry years, and artificial recharge of aquifers from river water could be undertaken. Estuarial storage schemes are also proposed, as is desalination of sea water. Due to complexity and cost of the process, desalination could be justified only if no future surface or groundwater source development was possible. (Grden-North Carolina)
W74-05864

WATER AND SEWER NEEDS OF LOW INCOME FAMILIES FOR THE MID-CUMBERLAND REGION OF TENNESSEE.
Mid-Cumberland Council of Government, Nashville, Tenn.
For primary bibliographic entry see Field 5D.
W74-05870

DEMANDS ON NATIONAL FORESTS REQUIRE COORDINATED PLANNING,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W74-05926

INTERREGIONAL PLANNING OF WATER RESOURCES ALLOCATIONS BY SYSTEMS ANALYSIS APPROACH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 4A.
W74-05932

6E. Water Law and Institutions

WATER POLLUTION CONTROL IN ALASKA,
For primary bibliographic entry see Field 5G.
W74-05465

NEW DIRECTIONS IN U.S. WATER POLICY--SUMMARY, CONCLUSIONS AND RECOMMENDATIONS FROM THE FINAL REPORT OF THE NATIONAL WATER COMMISSION.
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 6B.
W74-05522

PART 124--STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION IN THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
For primary bibliographic entry see Field 5G.
W74-05573

PROTECTION OF PUBLIC WATER SUPPLY.
Pa. Stat. Ann., secs. 691.1 thru 691.8 (1970).

Descriptors: *Pennsylvania, *Administrative agencies, *Water pollution sources, *Industrial wastes, Sewage effluents, Project planning, Permits, Regulation, Legislation, Water conservation, State governments, Recreation, Economic aspects, Aesthetics, Watershed management, Water supply, Waste water treatment, Water resources development, Conservation, Water utilization, Water quality, Public health, Environmental engineering.
Identifiers: *Administrative regulations, *Nuisance(Legal aspects).

It is a public nuisance to discharge sewage, industrial waste, or any substance into Pennsylvania waters which contributes to or causes pollution.

Unpolluted streams in the state are essential in the attraction of new industries, and in the development of the tourist industry. Clean water is also necessary to meet the demand for increased outdoor recreational facilities. In other words the prevention and elimination of water pollution is directly tied to the state's economic future. A comprehensive program of watershed management and control is needed. The Pennsylvania Sanitary Water Board is authorized to adopt regulations and to issue orders or permits to implement the statutory objectives. The Board should consider water quality management and pollution control in the watershed, present and possible future uses of particular waters, feasibility of combined or joint treatment facilities, the state of scientific and technical knowledge, and the immediate and long range economic effects. They are also responsible for the development and implementation of water supply and waste management plans. All fines, civil penalties, application fees, and permit fees will go into the Clean Water Fund to be used by the Board for the elimination of pollution. (Sperling-Florida)
W74-05574

RESERVOIRS AND WATER RESOURCES.
Pa. Stat. Ann., sec. 1999C (1965).

Descriptors: *Pennsylvania, *Administrative agencies, *Dams, *Reservoirs, *Water resources development, Administration, Legislation, Adoption of practices, Cities, State governments, Regulation, Water sources, Permits, Withdrawal, Water wells, Water supply, Water costs, Use rates, Project planning, Water utilization, Water distribution(Applied).
Identifiers: *Administrative regulations.

The board of commissioners of any county may obtain funds to expend on the acquisition, construction, operation, and maintenance of dams, reservoirs, and wells. The purpose of these structures is the utilization of surface, subsurface and ground water resources. Sites for these structures may also be acquired through the power of eminent domain. This board must obtain a permit from the Pennsylvania Department of Environmental Resources when such a permit is required. The board may enter into agreements for the regulation and sale of withdrawals and diversions of waters from the facilities with the approval of the state or federal agency with jurisdiction over the water resource. Facilities obtained by the board may be for any purpose except the generation of electric energy. The board is authorized to enter into contracts or agreements with any state or federal agency for the development and use of the county's water resources. It will also be lawful for any county to execute such agreements and contracts to provide for the utilization of water resources. Any county may also contract for the sale of water to any other county, town or public utility at reasonable, uniform rates. (Sperling-Florida)
W74-05575

EXPLORATION, PRODUCTION, OR TRANSPORTATION OF OIL OR GAS IN NAVIGABLE WATERS.
Miss. Code Ann., secs. 53-3-71 through 53-3-75 (1972).

Descriptors: *Mississippi, *Legislation, *Oil industry, *Navigable water, *Navigation, Transportation, Exploration, Structures, Construction, Permits, Public rights, Oil, Natural gas, Beds, Tidal waters, State jurisdiction, Legal aspects.

Any person, firm or corporation duly authorized to engage in the exploration, production or transportation of oil, gas or other minerals under Mississippi law, shall have the right to construct, operate and maintain facilities incident to such operations in any of the state's navigable waters. To do so, a permit for the construction, operation and maintenance must be obtained from the Mississippi oil and gas board, upon payment of five hundred dollars. The operation of any such facility which is on, under or across submerged land or which is located where the tide may ebb and flow is subject to the paramount right of the United States to control commerce and navigation, the right of the public to make free use of the waters and also any restrictions or prohibitions contained in the Mississippi Constitution. (Ritchie-Florida)
W74-05576

SIERRA CLUB V. LYNN (ACTION CHALLENGING EIS WHICH FOUND COMMUNITY PROJECT WOULD NOT POLLUTE WATER RESERVOIR).
364 F.Supp. 834-852 (W.D. Tex. 1973).

Descriptors: *Water pollution effects, *Water pollution sources, *Water policy, *Water resources, Judicial decisions, Natural resources, Underground structures, Erection, Buildings, Legislation, Legal aspects, Water law, Water resources development, Federal government, *Texas, Jurisdiction, Land use, Land management, Environmental effects, Alternative planning.
Identifiers: *National Environmental Policy Act, Environmental Impact Statements.

Plaintiffs filed suit against the Department of Housing and Urban Development (HUD), alleging that the development of a new community housing program would violate the National Environmental Policy Act (NEPA). Development is to be staggered over the next 30 years and the proposed site is in virtually an undisturbed natural condition. The court carried out an in-depth review of the Secretary's decision, but stated it could overrule the decision, under the Administrative Procedure Act (APA), only upon a showing of an arbitrary and capricious abuse of discretion. The opinion extensively discussed the applicability of the Urban Growth and New Community Development Act. The court not only felt the Secretary's decisions were sound, but that the project and its land-use controls were an extremely vital vehicle for capturing and controlling growth in a very sensitive geographical area. The opinion discussed the applicability of NEPA to the project and found the EIS sufficient, in that the Secretary had not violated the APA. In discussing the applicability of the Water Pollution Act, the court felt Congress could not improve upon the HUD standards for the protection of the aquifer in question. After the extensive review, the court held the new community should not be hindered as long as HUD imposed controls are maintained and to insure this, the court retained jurisdiction. (Sutton-Florida)
W74-05577

FLOOD PROBLEMS IN CERTAIN AREAS OF THE HACKENSACK RIVER BASIN; SADDLE RIVER BASIN; PASSAIC RIVER BASIN; AND POMPTON RIVER BASIN--STATE OF NEW JERSEY.
Hearing--Before the Subcommittee on Investigations and Review of the Committee on Public Works, U.S. House of Representatives, 93rd Cong., 1st Sess., February 23, 1973. 162p, 18 photo, 3 map.

Descriptors: *New Jersey, *Federal government, *Financing, *Local governments, *River basin development, *Flood protection, Budgeting, Land management, Watershed management, Streambeds, Flooding, Flood plain zoning, Engineering structures, Backwater, Government finance, Cost sharing, Project planning.
Identifiers: *Congressional hearings.

There is a long history of flooding problems in New Jersey. Land development takes place along the upper reaches of streams and encroachment occurs on the flood plain of the lower reaches until, in many cases, the problem reaches disaster proportions. Improvements in bridges and culver and major channel improvements can alleviate th to some extent. Officers and interested parti from each municipality presented their localize flood problems to the committee. Many of th needed improvements are too expensive for eac city or town to solve completely, so these hearin serve to bring the problems to the attention those in the federal government who can secu federal funds for the project. (Sperling-Florida)
W74-05584

THE COLUMBIA RIVER TREATRY: TH ECONOMICS OF AN INTERNATIONAL RIVE BASIN DEVELOPMENT,
Resources for the Future, Inc., Washington, D.C
J. V. Krutilla.
John Hopkins Press, Baltimore, Maryland, 196
211 p, 26 fig, 34 tab, 178 ref. Price: $7.50.

Descriptors: *River basin development, *Feder project policy, *Columbia River, *Cost-benef analysis, Federal government, Legislation, Tre ties, Internationl waters, Cost comparison Economics, Comparitive costs, Columbia Riv Basin, Water resources development, Watersh management.

The study attempts to establish whether certain a sumptions underlying a co-operative undertakir to develop an international river for mutual benef of the participating countries are in fact borne o by the resulting terms of such agreement. Co tained is a generalized and theoretical discussio of the problems and objectives of internation river development. The Columbia Treaty is the analyzed in light of the criteria developed an although the focus is on economic consideration social and political factors are also considere The conclusion is that while certain results we desired, they were obtained by means that we not consistent with the fundamental objective co-operative resources development--the achiev ment of shared economics. (Sutton-Florida)
W74-05585

NEPA IN THE COURTS: A LEGAL ANALYSI OF THE NATIONAL ENVIRONMENTAL POI ICY ACT,
Environmental Law Inst., Washington, D.C.
F. R. Anderson, and R. H. Daniels.
Johns Hopkins University Press, Baltimore, 197
324 p, 1126 ref, 3 append.

Descriptors: *Water resources developmen *Federal project policy, *Environmen *Environmental effects, *Evaluation, Feder government, Judicial decisions, Legal aspect Decision ration, Project purposes, Legislatior Environmental Engineering, Social aspects, Thir party effects.
Identifiers: *Environmental impact statemen *National Environmental Policy Act.

The real heart of the National Environmental Po icy Act (NEPA) is section 102 (2) (C) whic requires all federal agencies to prepare a detaile statement on all actions significantly affecting th quality of human environment. Because th guidelines laid down by the government to impl ment this provision have proved insufficient, th legal points involved have been raised by privat citizens in challenges to government actions, an this has given courts a major role in shaping th meaning of NEPA's 'action forcing' provisio Analysis are presented of the state of the law wit respect to all major issues which have been raise in suits under 102 (2) (C). (Sutton-Florida)
W74-05586

WATER RESOURCES DEVELOPMENTS AN NAVIGATIONAL IMPROVEMENTS I ALASKA.
Hearings--Before the Subcommittee on Wate Resources of the Committee on Public Work

S. Senate, 93d Cong., 1st Sess., August 1973.
? p.

scriptors: *Alaska, *Federal government, ?ater resources development, *Harbors, Oil in- stry, Commercial fish, Navigation, Political ects, Social aspects, Boating, Sport fishing, sthetics, Recreational facilities, Beach erosion, gineering structures, Bridges, State govern- nts, Funding, Project planning, Cost-benefit alysis, Feasibility studies, Cost sharing, Break- ters, Coastal engineering.
ntifiers: *Congressional hearings.

aska is behind in the development of small boat bor facilities, but is relatively advanced as to dium and deep water facilities. The need for leral funding is great if any meaningful improve- nt is to be accomplished. Very few of the pro- ts necessary would qualify as a corps project cause of their marginal benefit-to-cost ratios. st of the small boat harbors in Alaska are for mmercial fisheries and pleasure craft. Much of testimony concerns itself with specific pro- ted projects and their benefits and costs. erling-Florida)
74-05587

BLIC WORKS FOR WATER AND POWER VELOPMENT AND ATOMIC ENERGY MMISSION APPROPRIATION BILL, 1974 RT 6.
arings--Subcomm. of the Committee on Ap- priations--United States House of Representa- es 93d Cong., 1st Sess., May 14, 1973. 1265p.

scriptors: *Federal government, *Water ources development, *Water policy, overnment finance, *Flood protection, atershed management, Legislation, Administra- n, Planning, Political aspects, Flood control, dgeting, Economic efficiency, Participating ds, Priorities.

e hearings were conducted for the purpose of hering information and testimony regarding the ocation of funds in the 1974 Appropriation Bill water resources programs. Both opposition d support testimony were given by members of ngress and other individuals and organizations. ch emphasis was placed on the losses and vastation caused by the flooding of the Missis- pi River. Included in the testimony are reports damage caused by flooding, charts and reports current projects and expenditures, and reports various studies which have been conducted. ere are also many statements, letters, and com- ntaries by various interested individuals and ac- n groups. (Conko-Florida)
74-05588

LAWARE RIVER BASIN COMMISSION: AN- AL REPORT 1973.
laware River Basin Commission, Trenton, N.J.
74. 24 p, 2 map, 29 photo, 3 chart.

scriptors: *Delaware River, *Interstate com- ssions, *Interstate compacts, *Water policy, ?ater resources development, State govern- nts, Administrative agencies, Cooperation, ordination, Planning, Water utilization, Water nand, Water control, Structures, Dams, Reser- rs, Canals, Flood control, Flood prevention, od protection, Environment, Environmental tection, Pollution control, Water management, ter development, Recreation, Project-pur- ses, Industry, Agriculture, Municipalities.

complishments and problems encountered and pending in the Delaware River Basin in 1973 are viewed. Water control projects in the nature of ns and reservoirs have been constructed and re are in the development stages. Recreational continues to be abundant despite the damage urred in the upper portion of the river due to the vy flooding in June of 1973. Flood damage canals constructed to run parallel with the river at certain vulnerable points absorbed a maximum of stress but severe battering occurred to several municipalities despite the presence of such structures. Flood plain controls have reached their first stage completion point with a comprehensive research plan depicting and documenting the flood history of many vulnerable areas along the basin. Various environmental safeguard measures have also been implemented ranging from the creation of an Environmental Unit to coordinate various environmental problems and interstate programs to review the needs and demands of the many water-using operations of industry, agriculture and government along the basin. Water sales and water power capacity and services are also described. (Silber-Florida)
W74-05589

LEGISLATIVE FRAMEWORK FOR WATER RESOURCES MANAGEMENT IN ALABAMA.
Alabama Univ., University. Natural Resources Center.
Available from the National Technical Information Service as PB-224 322 $4.75 in paper copy, $1.45 in microfiche. Prepared for Alabama Development Office, Montgomery, March, 1973. 45 p, 66 ref.

Descriptors: *Alabama, *Water law, *Water resources development, *Comprehensive planning, *Conservation, Long term planning governments, Administrative agencies, Water utilization, Industries, Municipalities, Water allocation, Water distribution, Water demand, Legal aspects, Standards, Regulation, Water control, Water supply, Water quality, Water quality control, Coordination, Cooperation, Legislation.

The necessity of water resource planning for the future is emphasized even though Alabama's present water supply is abundant. Present judicial doctrines narrowly view the regulation of water usage as necessary only when controversy arises, and then on only a case to case basis. Present legal preferences avoid determining the most beneficial community use of water, and planning up until now has received little if any attention. Water must be recognized as a dwindling commodity to be paid for by the industries and municipalities that use and pollute it. Inherent in a long-term planning scheme already operative in many humid eastern states is a system of water allocation and distribution based on development and planning goals. Also essential is the single agency concept, giving one main, statewide agency authority to integrate all planned projects into a state masterplan for water resource development. A review and evaluation are included of existing water resources and planning statutes among the several states, as well as specific constitutional problems which might arise and proposed legislation. (Silber-Florida)
W74-05590

A BILL AUTHORIZING THE CONSTRUCTION, REPAIR, AND PRESERVATION OF CERTAIN PUBLIC WORKS ON RIVERS AND HARBORS FOR NAVIGATION, FLOOD CONTROL, AND FOR OTHER PURPOSES.
House Bill 10203, 93d Cong, 1st sess (1973), 144p.

Descriptors: *Federal government, *Legislation, *Water resources development, *Project purposes, *Water policy, Navigation, Navigable waters, Structures, Facilities, Planning, Flood protection, Flood prevention, Administrative agencies, Power plants, Hydro-electric power, Water management, Water quality, Water quality control, Land use, Land development, Land management, Easements, Ecology, Environment, Environmental effects, Fishlife, Wildlife conservation, Regulations, Wildlife management, Standards, Channels, Pollutants, Disposal, Shores, Shorelines, Banks.

This Bill entitled Water Resources Development Act authorizes the Army Corps of Engineers to design and implement multiple-purpose water resource development projects. The Corps has the duty and resonsibility of constructing, repairing and preserving various public works on rivers and harbors for navigation, flood control and other purposes. The Bill provides for hurricane flood protection and other flood prevention appropriations on a regional basis. Also included are guidelines for hydro-electric power installation sites. In the development of the several projects provided for in the Act, the Corps shall assure that proper provisions are made for fish and wildlife management, including acquisition of necessary lands or environmental easements. Such easements shall prevent the clearing of the subject land for commercial agricultural purposes or any other purposes inconsistent with wildlife habitat. Also among the provisions are directions to the Corps to remove certain sunken vessels which impede navigation and authorization to clear channels of such trees, roots and debris and other objects which impair safe navigation. The Corps is authorized to operate and maintain models to test proposals affecting the environmental quality of the regions, including sanitary intrusion, dispersion of pollutants, water quality, shoreline changes and others. (Silber-Florida)
W74-05592

LIFE OF THE LAND V. BRINEGAR (ACTION TO ENJOIN SEAWARD RUNWAY FOR AIRPORT).
485 F. 2d 460-474 (9th Cir. 1973).

Descriptors: *Federal project policy, *Project planning, *Environmental effects, *Wildlife habitats, *Project purposes, Federal government, Inter-agency cooperation, Judicial decisions, Legal aspects, Administrative decisions, Cost sharing, Legislation, Hawaii, Ecology, Pollutants.
Identifiers: *National Environmental Policy Act(NEPA), Environmental Impact Statements.

After consideration of the record, the court held the necessary environmental impact statement (EIS) had complied with the requirements of the National Environmental Policy Act (NEPA) and also comported with the Airport and Airway Development Act as no feasible alternatives were shown. The court stated that compliance with NEPA relating to the EIS is based on good-faith objectivity rather than subjective impartiality. Plaintiffs urged consideration of measures to protect a rare water bird felt to be endangered by the proposed project, and an alleged failure to comport with the NEPA requirement of alternative proposals. The court found nothing in the record which indicated the project's planners believed that the project would have an irreparably deleterious effect upon the environment, but found various environmental side benefits, such as the reduction of air and water pollution, enhancement of recreational boating facilities and improvement in area fishing. With respect to alternative proposals, the court held there was no need to consider alternatives, the effect of which cannot be reasonably ascertained and where implementation is deemed remote and speculative. The EIS need only set forth those sufficient to permit a reasoned choice. As there was substantial evidence and no arbitrary or capricious action taken, the circuit court affirmed for the defendants. (Sutton-Florida)
W74-05593

WASTE DISPOSAL.
N.Y. Environmental Conservation Law, sec. 27-0301 (1972).

Descriptors: *Waste water(Pollution), *Water quality, *Water pollution control, *Waste disposal, Waste water disposal, *New York, Sewage disposal, Septic tanks, Sanitary engineering, Natural resources, Water sources, Legisla-

tion, Administration, Water pollution effects, Permits.

The statute deals with private waste disposal and the registration of septic tank cleaners and industrial waste scavengers. No person shall engage in removing or disposing of solid or liquid wastes from domestic sewer systems and treatment facilities or from waste-producing operations of factories or commercial establishments without first obtaining a certificate of registration. This certificate will be issue the Commissioner of Environmental Conservation, and the procedure for obtaining the certificate is set forth. If the Commissioner determines that the applicant's nature and operation of business will be detrimental to the natural resources or environment of the state, he may refuse issuance or impose conditions so as to adequately protect against unreasonable degradation of those resources. The registration certificate requires an annual report to the Commissioner indicating the number and type of installations emptied or cleaned, the volume and nature of wastes disposed and the place and manner in which they were finally disposed. The registration shall be renewed annually, and the Commissioner may suspend or revoke any certificate upon proof that the registrant has been found guilty of violating any of the provisions of the statute. (Sutton-Florida)
W74-05594

WATER POLLUTION--WASTE DISPOSAL.
N.Y. Environmental Conservation Law, sec. 17-0701, (1972).

Descriptors: *Water pollution, *Water quality, *Water pollution control, *Waste disposal, *Waste water disposal, *New York, Sanitary engineering, Legislation, Administration, Water sources, Water pollution effects, Nuclear powerplants, Hydroelectric plants, Electric power, Ultimate disposal.
Identifiers: *Deep well disposal system.

This statute deals with water pollution control and the permits needed for operation of a disposal system, or the opening of a new sewage outlet. Virtually all types of waste are covered. A project plan for the proposed operation must be submitted to, and approved by, the Commissioner of Environmental Conservation before a permit will be issued. Steam-electric generating facilities and nuclear plants are specifically mentioned. An exception is given to a disposal system which discharges sewage effluent without the admixture of industrial wastes or other wastes from a private dwelling of less than three families and the discharge consists of a flow of less then one thousand gallons a day. Counties, cities, and towns are able to adopt and enforce additional local laws provided that they are not inconsistent with the provisions of this statute or the sanitary code. The commissioner may delegate his duties subject to such conditions as he may establish. Public hearings are provided for in connection with the construction, operation, alteration or extension of a deep well disposal system in the locale in which it will operate and notice requirements are set forth. Public hearings will also be required upon denial, revocation or modification of an issued permit. (Sutton-Florida)
W74-05595

WATER POLLUTION CONTROL POWERS.
N.Y. Environmental Conservation Law, secs. 15-0313 through 15-0315 (1972).

Descriptors: *Water pollution, *Water pollution control, *Water quality control, *Water resources, *Water conservation, *New York, Legislation, Interagency cooperation, Cost allocation, Administration, Water policy, Water pollution sources, Water resources development, Water quality, Environmental conservation, Comprehensive planning.
Identifiers: Administrative regulations.

This statute deals with the New York department of water resources and the powers and responsibilities of that department with respect to water pollution control. The department is authorized to classify state waters in accordance with the best usage in the public interest theory and to alter, modify or amend water quality and purity standards for the control of pollution in those waters. The department is further authorized to adopt and enforce regulations governing the use of chemicals in water for the control and elimination of aquatic vegetation, for the control of undesirable fish or for the control of aquatic insects, subject to certain provisions set forth. Cooperation between the department and other governmental bodies is in order to adequately protect the interests of the state in its water resources. The department shall be the agent of the state to obtain the aid and assistance of appropriate federal agencies and may enter into contracts when required. Such contracts, containing cost allocations, may be made by the department, provided that payment by the state shall not exceed one-half the cost, including personal service, of the service rendered by the federal agencies. (Sutton-Florida)
W74-05596

PROTECTION OF WATER.
New York Environmental Conservation Law, secs. 15-0501 thru 15-0515.

Descriptors: *New York, *Legislation, *Permits, *Water law, *Water protection, Water policy, Structures, Impoundments, Dams, Dikes, Legal aspects, Administrative agencies, Alteration of flow, Diversion, Obstruction of flow, Erosion, Pollution control, Flood prevention, Flood protection, Natural resources, Ecology, Environment, Resources development, Water resources, Water utilization, Navigable waters, Water demand, Water sources.

No person or public corporation shall change, modify or disturb the course, channel or bed of any stream or remove any sand, gravel or other materials without a permit. Before issuing a permit for any of the above activities the New York Department of Environmental Conservation shall determine the effect that such will have on soil erosion, increased turbidity of the waters, irregular variations in the velocity, temperature and level of the waters and also the resultant loss of fish and aquatic wildlife and the dangers of flooding and pollution. The Department shall also consider the relative effect that such activities will have on the natural resources of the state and the general health, safety and welfare of the people of the state. Permits shall be issued only when the Department has made certain that such projects will afford proper protection to the beneficial public uses of such water courses. Provisions of this enactment shall not affect the navigable waters of the state. Construction of dams, impoundment structures, docks and piers shall also be made only be permit pursuant to the directions of this statute. (Silber-Florida)
W74-05598

ALTERATIONS IN WATERCOURSES AND LAKES.
New York Environmental Conservation Law, sec. 15-0701, (1972).

Descriptors: *New York, *Legislation, *Water law, *Water policy, *Water control, Legal aspects, Riparian rights, Prescriptive rights, State governments, Water resources, Water resources development, Water demand, Water allocation, Water distribution, Water levels, Water supply, Water utilization, Lakes, Streams, Flow, Alteration of flow, Diversion, Obstruction of flow, Structures, Reasonable use.

Private riparian land-owners may alter the natural flow, quantity, quality or condition of a natural water-course or lake either on or below the surface of the earth. Withdrawal, impoundment or ol structions of the water in such watercourse or lak or addition of water thereto or changes in th banks, beds, course or other physical chara teristics of such watercourses or lakes is permiss ble if reasonable, as long as it is not immediate injurious to neighboring riparian or non-riparia owners at the time of commencement of such a terations. No action for injunction or for nomin damages shall be maintainable unless such alter tions are causing plaintiff harm, or would cau immediate harm if and when begun. 'Harm' sha mean interference with a present use of the wat by the complaining party, a decrease in the mark value of his interest in riparian land, or inte ference with his present enjoyment of such ripar an lands. (Silber-Florida)
W74-05599

INTERFERENCE WITH FISH AND WILDLIF IN STREAMS AND RIVERS.
New York Environmental Conservation La secs. 11-0505 thru 11-0507 (1972).

Descriptors: *New York, *Legislation, *Wat law, *Wildlife management, *Wildlife conserv tion, Ecology, Conservation, Natural resource Resource development, Fish management, A ministrative agencies, Structures, Habitat Habitat improvement, Environment, Stream Stream flow, Regulation, Water policy, Gan management.
Identifiers: Administrative regulations.

Except as permitted by the New York Departme of Fish and Wildlife, no person shall obstruct th passage of fish in any stream or river by a scre or any other means. The Department may ord the removal of any existing obstruction. Ad tionally, no person shall hold back or divert wat in any stream which supplies a hatchery or ta fish from any hatchery waters, without the D partment's permission. No deer or bear traps sha be made, nor shall any person use any devi which prevents frogs from having free access a egress from water. Except as permitted by the D partment, no person shall at any time disturb beaver dam, house or den or a muskrat house den or any structure constructed by a muskrat which it can take shelter. No person may wilful liberate within the state any wildlife except und permit from the Department. (Silber-Florida)
W74-05600

POLLUTING STREAMS.
New York Environmental Conservation Law, se 11-0503 (1972).

Descriptors: *New York, *Legislation, *Wat law, *Streams, *Pollution control, Wastes, Was disposal, Sewage, Sewage disposal, Water quali control, Water quality, Water purification, Wat resources, Fish life, Wildlife, Water managemer Water development, Water policy, Pollutio abatement, Pollution sources, Conservatio Natural resources, Solid wastes, Solid was disposal, Sludge, Industrial wastes, Agricultur wastes.
Identifiers: Hazardous substances(Pollution).

It is unlawful for dyestuffs, coal tar, refuse fro gas houses, cheese factories, creameries, co densaries, or canning factories, sawdu shavings, tan bark, lime, acid, oil or other delete ous or poisonous substance to be thrown or lowed to run into any public or private waters, quantities injurious to fish life, protected wildli or waterfowl or their propagation. Nor shall a person place sewage or any like substances in a place where it can find its way into any of th above waters. Oil, acid, sludge or wastes from ve sels shall not be dumped or released into th waters of the Hudson or Mohawk Rivers. N earth, soil, refuse or other solid substances exce snow or ice, shall be disposed of in any stream tributary which is inhabited by trout, or upon th

anks of any such waters. Dumps and disposal eas for refuse along the banks of trout streams, all be operated in such a manner that the solid bstances deposited thereon shall not enter the ream at any stage of water level. (Silber-Florida)
74-05601

EPARTMENT OF ENVIRONMENTAL CONERVATION.
.Y. Environmental Conservation Law, secs. 3-01 thru 3-0303 (1972).

escriptors: *Water resources development, Environment, *Conservation, *Water policy, New York, Pollution abatement, Water sources, Administration, Inter-agency cooperaon, Water demand, Water supply, Water law, egislation, Adoption of practices, Coordination, atural resources planning, Financing.

eneral functions, powers, duties and jurisdiction New York's Department of Environmental onservation are described. The Commissioner of ie department shall have the power to carry out ie state's environmental policy, and those owers, set forth, are varied and extensive. To rther carry out state environmental policy, the epartment is authorized to execute contracts, ange environmental standards and criteria, enge in consultations, and undertake studies. A atewide environmental plan for the management d protection of environmental quality and natul resources is provided for, and in formulating is plan, the department shall conduct public earings, cooperate with other departmental agenes and individuals, and request and receive such ssistance and data as may be necessary to enable ie department to carry out its responsibilities nder the statute. When funds are available, the ommissioner may acquire any real property ecessary for any of the purposes or functions of ie department by purchase or appropriation. Title such property shall be taken in the name of and ested in the state. (Sutton-Florida)
74-05602

ISHWAYS AT DAMS OR OBSTRUCTIONS.
. H. Rev. Stat. Ann., ch. 211:8 to ch. 211:8C upp 1972).

escriptors: *Fish, *Fish barriers, *Fish passages, Dams, *New Hampshire, Fish guiding, Fish anagement, Legislation, Administration, Ecoloy, Fish conservation, Water policy, Water law, egal aspects, Structures, Impounded waters.

ish passage facilities are to be constructed and aintained at existing dams in accordance with a x point procedural plan, which shall be under the spices of the director of the fish and game deartment. Public hearings, the sharing of construon costs, designs and locations of the assageways, the operation of the passageways, d appeal procedures are set forth in the plan. awful inspections by the director or his represenative are authorized and the procedural plan shall ot apply to those dams under license by the ederal Power Commission. (Sutton-Florida)
74-05603

NTERSTATE MINING COMPACT.
.C. Gen. Stat., secs. 74-37 thru 74-38 (1967).

escriptors: *North Carolina, *Mine drainage, Water pollution sources, *Mine wastes, Coordination, *Land management, *Interstate ompacts, Decision making, Social aspects, Legal spects, Public health, Safety, Reclamation, State overnments, Legislation, Administration, Adinistrative agencies, Water conservation, ecreation, Wildlife habitat, Waste ater(Pollution), Water resources, Water quality, esthetics.
lentifiers: Administrative regulations.

The effects of mining on the availability of land, water and other resources present many problems which can be approached only with due consideration of both public and private rights. This interstate compact is aimed at the protection and restoration of land, water, and other resources affected by mining. It is also aimed at the reduction and elimination of water pollution attributable to mining. Each party state will formulate and establish an effective program for the conservation and use of mined land. The program will seek to accomplish the following: the protection of the public; the protection of landowners from damage to their land and structures on the land; and the safe handling of mine wastes to reduce effects on the aesthetic value and utility of land and water. The Interstate Mining Commission has power to study mining operations to gain knowledge on the effects of such operations on soil, water, animal life, recreation, and community development. The Commission can also make recommendations as to aspects of law within the purview of this compact. The Commission will be made up of the governor of each state. The governor shall have the assistance of an advisory body and the statute establishes this committee to be called the 'mining council.' (Sperling-Florida)
W74-05604

NORTH CAROLINA WATER SAFETY COMMITTEE.
N.C. Gen. Stat., secs. 75A-20 thru 75A-26 (1969).

Descriptors: *North Carolina, *Recreation, *Safety, *Administrative agencies, State governments, Legislation, Coordination, Adoption of practices, Project planning, Water demand, Recreation demand, Social aspects, Water policy, Administration, Education, Research, Political aspects, Local governments, Budgeting, Operating costs.

This statute establishes the North Carolina Water Safety Committee to act as an advisory body to public and private agencies and interests in regard to the maintenance of a water safety program. Members on the Committee will be appointed by the Governor for three year terms. Local authorities may sponsor local safety committees to consult for the needs and desires of the public in matters of water recreation and safety. Members of this committee will receive no remuneration except travel and subsistence allowances. The members are under an obligation to keep themselves informed on problems of water recreation and safety in their area. They are to study these problems and also those that may be referred to them by their sponsor or by the chairman of the North Carolina Water Safety Committee. They are to make reports either on their own motion or in response to a request for a study on these problems, with suggestions for remedies where feasible. These reports may be made to the sponsor, the State committee, or any public or private person or agency with the power to effect improvements in the level of water recreation safety to the public. The committees may also coordinate programs of public education in the field of water safety. (Sperling-Florida)
W74-05605

PUBLIC WATER SUPPLY SYSTEMS.
N.C. Gen. Stat., sec. 130-161.1 (1971).

Descriptors: *North Carolina, *Public health, *Administration, *Water resources development, Water demand, Water distribution(Applied), Water resources, Water storage, Water supply, Drought tolerance, Water purification, Water quality, Water yield, State governments, Regulation, Legislation, Adoption of practices, Administrative agencies, Political aspects, Water treatment, Domestic water, Disinfection, Safety, Economic aspects, Specifications, Water pollution.
Identifiers: *Administrative regulations.

The increase in small privately owned public water supplies makes it difficult for state regulating agencies to maintain proper standards of service, quality, and safety. Small systems are usually inferior to larger ones as to source, facilities, and quality. Few small systems give any treatment and this is a potential hazard. Most systems are installed for domestic use with little thought to adequate fire protection. Small systems are difficult to expand or to incorporate into larger systems. The lack of ample source and storage facilities make, the smaller system vulnerable to drought. Many small systems are owned by real estate developers whose interest ends with the sale of lots served by the system. Better coordination and management of water supply systems is essential to protect the public health. The North Carolina Department of Human Resources is authorized: to adopt standards and criteria for the design and construction of public water supply systems; to require improvements to existing public water supply systems; and to require disinfection of water supplies when coliform bacteria count is high, or when the continued use of the water is potentially hazardous. (Sperling-Florida)
W74-05606

WATER QUALITY AND EFFLUENT STANDARDS.
Md. Code Ann. art. 96A, sec. 27 (Supp 1973).

Descriptors: *Maryland, *Legislation, *Administrative agencies, Specifications, *Waste water disposal, *Waste water treatment, State governments, Water conservation, Public health, Wildlife, Water storage, Sewage effluents, Radioactive wastes, Confined water, Water quality, *Water quality standards, Water wells, Groundwater.

Maryland has enacted water quality and effluent standards applicable to the waters of the state. The standards are to protect the public health and to insure the present and future use of such waters for public water supply, fish and wildlife, recreational purposes, and other legitimate uses. The water quality standards will specify the concentrations of pollutants in water, the minimum permissible concentrations of oxygen and other desirable matter, and the temperature range for the water. Effluent standards will specify the concentrations and the physical, thermal, chemical, biological, and radioactive properties of wastes which may be discharged into the waters. It also prescribes regulations for filling and sealing of abandoned water wells and holes, to prevent groundwater contamination, seepage, and drainage into the waters of the state. The statute empowers the administration to formulate regulations for pesticides and other articles which constitute a water pollution hazard. The methods, facilities, standards, and devices for transfer, storage, treatment, and disposal of oil and other substances, as well as standards and procedures for monitoring pollutants, are also prescribed by regulation. (Sperling-Florida)
W74-05607

POLLUTING OR CONTAMINATING STATE WATERS.
Md. Code Ann. art. 96A sec. 26 (Supp 1973).

Descriptors: *Maryland, *Water pollution sources, *Water conservation, *Permits, *Legislation, Waste water treatment, State governments, Waste water disposal, Discharge(Water), Public health, Treatment facilities, Water pollution treatment, Legal aspects, Administrative agencies, Regulation, Pollutants.

It is unlawful for any person to discharge any pollutant into the waters of the state of Maryland. Any person intending to construct or modify any disposal system or any state-owned treatment facility or any other outlet which would result in a discharge of pollutants or an increase in the

discharge of pollutants must obtain a permit. Such a permit may issue after public notice and opportunity for public hearing on condition that the discharge meets or will meet all applicable state and federal water quality standards. Each permit will be of a term not to exceed five years. A new permit will be issued after the same procedure are followed and conditions are met. Issuance of the permit is contingent upon the grant of a right of entrance upon the permit site at any reasonable time to inspect and investigate for violations of the permit conditions. It may be required of the owner or operator of any source of a discharge of pollutants to: (1) establish and maintain records; (2) make reports; (3) maintain monitoring equipment; (4) sample discharges; and (5) provide other information as to pollutants. Toxic effluent standards may be imposed on industrial users of publicly owned treatment facilities. (Sperling-Florida)
W74-05608

POWER PLANT ENVIRONMENTAL RESEARCH PROGRAM.
Md. Code Ann. art. 66C, sec 767 (Supp 1973).

Descriptors: *Maryland, *Administrative agencies, *Adoption of practices, Research and development, State governments, Legislation, Project planning, Water resources development, Environmental effects, Economic aspects, Permits, Electric power plants, Water conservation, Social aspects, Regulation, Land use, Baseline studies.

Maryland has established a continuing research program for electric power plant site evaluation and related environmental and land use considerations. The Secretary of Natural Resources is to institute effective procedures for coordinating environmental research assignments, so as to prevent the dissipation of money, time, and effort. The state's electric companies will be reimbursed, from the fund created for environmental research, for any environmental research specifically required to satisfy application and permit requirements of federal, state, and local regulatory agencies. To qualify for this reimbursement the electric company must furnish in advance an outline of the program and its estimated cost. Each program will include: (1) general biological and ecological baseline studies; (2) field and laboratory research to assist prediction of the effects of variation of natural waters caused by electric generating plant operations; (3) provisions for monitoring the operations of existing power facilities; (4) research and investigations relating to the effects on air resources; (5) an environmental evaluation of the plant site in regard to the waters of the state; (6) environmental effects of new power generation technologies; and (7) an analysis of the socio-economic impact of electric power generation facilities on the land uses of the state. (Sperling-Florida)
W74-05609

SCENIC RIVERS.
Md. Code Ann. art. 66C, secs. 759-763 as amended (Supp 1973).

Descriptors: *Maryland, *Legislation, *Aesthetics, *Scenery, Water pollution effects, Engineering structures, Recreation, Wildlife management, Water conservation, Rivers, Administrative agencies, Environmental sanitation, Flood protection, Channelization, Fishing, Land management, Project planning, Water resources development, Land use, Water resources, River flow, Obstruction to flow.

The Maryland Scenic Rivers Review Board has been created to protect the scenic, fish, wildlife, and other recreation values of Maryland rivers. The Board is to inventory all potential scenic river sites. The statute gives a description of what rivers, streams, or sections of streams and related adjacent lands may be recommended to be included in the system of scenic rivers. The scenic river program is designed to provide wise management of the resources on the land and preservation of their scenic qualities. Development is to be limited to activities such as fishing, hunting, hiking, etc. A study and plan for use and development of water and related land resources for public and private use will be promulgated for each of the components of the Scenic Rivers System. In all planning for the use and development of water and related land resources, including the construction of diversions, roadways, crossings, channelization, locks, and canals, full consideration must be given to the river as a scenic resource. The Secretary of the Maryland Department of Natural Resources must approve any structure impeding the natural flow of a scenic river. (Sperling-Florida)
W74-05610

STATE WETLANDS.
Md. Code Ann. art. 66C, sec 720 (Supp 1973).

Descriptors: *Maryland, *State governments, *Riparian rights, *Legal aspects, *Boundaries(Property), Riparian land, Riparian waters, Navigable waters, Accretion(Legal aspects), Avulsion, Bank erosion, Reclamation, Shore protection, Engineering structures, Administrative agencies, Legislation.

A natural person who owns land bounding on navigable waters is entitled to all natural accretions to his land. Such a party may reclaim fast land lost by erosion or avulsion during his ownership of the land after January 1, 1972. The extent of this reclamation is to provable preexisting boundaries. Improvements into the waters in front of his land are allowed for the purposes of preserving his access to navigable water or protecting his shore against erosion. An improvement, after construction, is the property of the owner of the land to which it is attached. Other uses approved by the Maryland Board of Public Works are not excluded by the operation of this section. (Sperling-Florida)
W74-05611

SANITARY FACILITIES FUND.
Md. Code Ann., art. 43, sec. 387B (1971).

Descriptors: *Maryland, *Administrative agencies, *Adoption of practices, *Coordination, Project planning, Economics, State governments, Decision making, Engineering structures, Public health, Waste water disposal, Waste water treatment, Solid wastes, Budget, Sewage disposal, Drainage systems, Conduits, Legislation, Governmental interrelations.
Identifiers: *Administrative regulations.

This statute establishes a fund to be utilized in the planning and construction of water and sewerage facilities and for solid waste disposal systems and solid waste acceptance facilities. The Maryland State Department of Health is authorized to utilize funds appropriated in the State operating budget which provides for general local health services. The proportion of State, county, and local funds shall be that which is specified for the financing of minimum health services. The construction segment of the funds shall be available to finance the basic main facilities of a sewerage system for the collection and treatment of sewage and industrial wastes from lateral or collector sewers. The State Department of Health and the local governments are authorized to enter into joint financing agreements for the utilization of whatever federal grants may be available. In the event that a special governmental agency is created to provide sanitary facilities within a county or municipality, the funds cited in this section may be available to such an agency. (Sperling-Florida)
W74-05612

WATER MANAGEMENT AND THE ENVIRO MENT.
Organization for Economic Co-Operation a Development, Paris (France). Water Manageme Section Group.
For primary bibliographic entry see Field 6G.
W74-05625

THE EXTERNALITIES OF A TORRI CANYON SITUATION; AN IMPETUS FC CHANGE IN LEGISLATION,
McCarty and Noone, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05628

LEGAL-ECONOMIC ASPECTS OF FISHERI SESSION SUMMARY,
Louisiana State Univ., Baton Rouge. Law Schoc H. G. Knight.
In: Proceedings of Fourth National Sea Gr Conference, October 12-13, 1971, Madis Wisconsin, 1225 West Dayton Street, Sea Gr Program, University of Wisconsin, Madison, 187-189.

Descriptors: *Fisheries, *Fish manageme United States, Legislation, Economics, Le aspects, Oceans, United Nations, Federal gove ment, Decision making, Research and devel ment.
Identifiers: Sea Grant.

A wide range of problems concerning internatio fishery management were considered by a N tional Sea Grant Program panel on 'Leg Economic Aspects of Fisheries,' which met October 13, 1971. One issue was the legal a economic aspects of the conservation of the liv resources of the high seas. Also considered w the legal and economic aspects of the allocation fisheries management, as well as Article III, wh is the United States' proposal for internatio fishery management as presented to the Uni Nations Seabed Committee. The fourth ma issue was the question of decision-mak procedures in the United States Government fisheries and other law of the sea matters. Only issues raised are identified in this summary a cles, with no reference to the main substance that discussion. However, the issues were relat to the role which Sea Grant support recipie might play in assisting in a solution of the issu (See also W74-05644) (Pinsky-Wisconsin)
W74-05649

FISHERY PROBLEMS AND THE U.S. DRA ARTICLE,
Resources for the Future, Inc., Washington, D.C F. T. Christy, Jr.
In: Proceedings of Fourth National Sea Gr Conference, October 12-13, 1971, Madis Wisconsin, 1225 West Dayton Street, Sea Gr Program, University of Wisconsin, Madison 200-217. 19 ref.

Descriptors: *Fishing, *Fish manageme *International law, Economic impact, Conser tion, Legislation, Oceans, United States, Milit aspects, Submarines, Social aspects, Econor efficiency.
Identifiers: Distribution of wealth, Soc sciences, U.S. Draft Article on Fisheries.

In order to provide a background for an asse ment of the United States Draft Article on Fis ries, three main points were discussed. The firs that freedom of fishing is no longer a viable c cept, for increased demand for these limit supply resources has resulted in depletion, caus one unit's usage to diminish the value to oth units. Another point of discussion is that of c tributing the ocean's wealth, the means of distri tion of wealth, and the criteria for distribution wealth. The third point is that the problems to solved are complex and require consideration

ɔcial scientists if they are to be resolved without ɔnflict. The U.S. Draft Article on Fisheries seeks ɔ preserve the status quo, with little relevance for ıe developments that are taking place and no use-ıl guide for future decisions. U.S. military in-rests in the sea provide a severe constraint on ıe potential of the U.S. Draft Article. Other short-ɔmings of the Article were caused by lack of put from the concerned public and limited social ience research in this area. (See also W74-05644) insky-Wisconsin)
74-05650

N OVERVIEW OF THE JULY-AUGUST 1971 REPARATORY SESSION OF THE LAW OF HE SEA,
epartment of State, Washington, D.C. Office of e Legal Advisor.
.. H. Nordquist.
oc. available from the National Technical Infor-ation Service as COM-72-11408, $3.00 in paper ɔpy, $1.45 in microfiche. In: Proceedings of the lth Annual Session Gulf and Caribbean Fisheries ıstitute, November 1971, Rosenstiel School of arine and Atmospheric Science, University of iami, Coral Gables, Florida, p 6-10, 1972.

escriptors: *Law of the Sea, *Legislation, Conferences, Navigation, United Nations, Trea-s, Fisheries, International waters, Reasonable ıe, Water pollution control, Research and velopment.
lentifiers: Seabed exploitation, National jurisdic-ɔn, Marine pollution, Geneva(Switzerland).

perspective is given of the current stage of inter-ıtional negotiations on the Law of the Sea. Two reparatory sessions of a comprehensive Law of e Sea conference (1973) have been scheduled by e United Nations General Assembly. Subcom-ittee I will prepare draft treaty articles on an in-rnational regime for the seabed area beyond the nits of national jurisdiction. Subcommittee II ill compile a comprehensive list of, and draft eaty articles on, subjects and issues relating to aditional Law of the Sea matters such as the ter-torial sea, international straits, and fisheries. ubcommittee III will deal with preservation of e marine environment and scientific research. he United States stressed the desirability of in-rnationally agreed standards as well as the im-ɔrtant role of the specialized agencies of the nited Nations and various inter-governmental oups in coping with marine pollution. The ıestion of freedom of scientific research in the eans was the subject of some differences of ɔinion. While meaningful negotiations are just ginning, the number and quality of the presenta-ɔns in Geneva did indicate that systematic ogress was being made, as articulation of na-ɔnal interests is a necessary first step. (See also 74-05652 thru W74-05659) (Jones-Wisconsin)
74-05651

CCEPTABILITY TO THE FISHING INDUS-RY OF THE CURRENT U.S. POSITION ON SHERIES. ARTICLE III -- LAW OF THE SEA ONFERENCE -- 1973,
ational Shrimp Congress, Inc., Key West, Fla.
. R. Neblett.
: Proceedings of the 24th Annual Session Gulf d Caribbean Fisheries Institute, November 71, Rosenstiel School of Marine and At-ospheric Science, University of Miami, Coral ables, Florida, p 11-14, 1972.

escriptors: *Marine fisheries, *Law of the Sea, Conferences, *United States, United Nations, ternational law.

ıe United States fishing industry takes strenuous ception to the U.S. official position, submitted Article III, Law of the Sea Conference. The nilarity of proposals advanced by the U.S. as a ustee zone' and Mexico as a 'management' con-pt is construed as an attempt to provide a device to allow some foreign fishing. Fisheries seek to be heard in the inner circles of government in order to advise at critical times as to the proposals tabled, both with regard to domestic fisheries and with regard to the reactions of foreign governments. Most major fisheries submitted concrete proposals at the 1971 University of Rhode Island Law of the Sea session, which sought to safeguard the proponent's interests and at the same time offer solutions for other U.S. fisheries. Subsequent to the University of Rhode Island meeting, representatives of tuna, shrimp, and salmon fisheries met in Los Angeles and prepared a joint statement which reflected acceptable positions for these giants, whose total production in dollars represents over 60% of the total U.S. flag production. It is predicted that unless the true significance and importance of a U.S. position on fisheries emerges, the presently planned tactic will fail. (See also W74-05651) (Auen-Wisconsin)
W74-05652

ALTERNATIVES TO THE CURRENT U.S. POSITION ON FISHERIES,
Miami Univ., Coral Gables, Fla. School of Law.
T. A. Clingam, Jr.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida, p 15-18, 1972.

Descriptors: *United States, *Marine fisheries, *Law of the Sea, Legislation, Coasts, Navigation, Priorities, Management, Zoning.
Identifiers: Territorial seas, Coastal waters.

It is suggested that Article III of the Law of the Sea Conference include the establishment of a zone of at least limited coastal state jurisdiction that would enable the state to implement timely and effective fishery management and afford economic protection to coastal state fisheries. Regulations pertinent to such a management scheme necessarily pertain to stocks which do not conform to artificial boundaries, although the drawing of such lines may be required for enforcement purposes and for the clear delineation of economically significant zones. However, such lines should be constructed on biological rather than geometrical criteria. A proposal for effective management should also permit the coastal state to maximize its sustainable returns, reserving the remaining catch, if any, to other nations. More responsible, and smaller, groups of nations having realistic interests in the regulated stock should be formed, and care should be taken how the participating nations are identified. The scheme must have some effective mechanism for settlement of disputes. The seeming intransigence with regard to freedom of transit, if it persevers, will leave scant hope for acceptance of the U.S. proposal. Failure to agree would stimulate a period of unrestricted unilateral claims to increased coastal state competition, an inherently self-destructive solution. (See also W74-05651) (Auen-Wisconsin)
W74-05653

FOREIGN FISHING OFF THE SOUTHEASTERN UNITED STATES UNDER THE CURRENTLY ACCEPTED CONTIGUOUS SEA LIMITATION,
National Marine Fisheries Service, St. Petersburg, Fla. Southeast Region.
C. M. Fuss, Jr.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida, p 19-32, 1972. 8 fig, 3 tab, 4 ref.

Descriptors: *Gulf of Mexico, *Marine fisheries, *International law, Treaties, Southeast U.S., Atlantic Ocean, Pacific Northwest U.S., Commercial fishing, Northeast U.S., Shrimp.
Identifiers: *Foreign fishing, *Surveillance, Caribbean Sea.

Control of foreign fishing beyond the 12 mile fishery zone can only be regulated by bilateral and multilateral international fishery agreements. The extent of foreign fishing between October 1970 and October 1971 off the southeastern U.S., the Atlantic coastal waters south of 37 degrees north latitude and the Gulf coastal waters from Florida to the Mexican border are summarized. Surveillance flights are scheduled through the Coast Guard in Miami and New Orleans. Additional sighting reports are obtained from state conservation agencies, commercial and sports fishermen and U.S. merchant vessels. The estimated foreign catch of 100 million pounds of the southeastern U.S. amounted to about 8% of the foreign catch off the northeastern U.S. in 1970 (1.3 billion pounds) and about 5% of the U.S. domestic catch in the southeast region. It is compared with the northeastern U.S. where the foreign catch is currently about 98% of the domestic catch. Comparison of the estimated value of Atlantic and Gulf foreign catches gives further insight into possible problems in the Gulf area. Uncontrolled foreign fishing would constitute a significant threat to the shrimp industry of the southeastern United States. (See also W74-05651) (Jones-Wisconsin)
W74-05654

POLLUTION MANAGEMENT IN THE COASTAL STATES,
Coastal States Organization, Savannah, Ga.
T. H. Suddath.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida, p 42-47, 1972. 1 fig.

Descriptors: *Water pollution control, *Regulation, *Pollution abatement, *Management, *Coasts, Political constraints, Estuaries, Marshes, Wetlands, Oceans, Recreation, Islands, Legislation, State governments.
Identifiers: *Coastal zone management.

A state structure for the management of pollution in the coastal zone based on a systems management concept is presented. Key management areas are defined as fresh water pollution, mineral deposits, air pollution, coastal marshlands, wetlands, estuaries and recreational areas. Key issues involved in coastal zone pollution management involve definition of the extent of management control, allocation of responsibility among various levels of government and delineation of the management areas. The proposed state management structure complements the three new federal agencies (Environmental Protection Agency, National Oceanic and Atmospheric Administration, Council for Environmental Quality), thus facilitating participation in their grants and regulatory programs. This structural parallel allows a balance between local and federal interests. The state management structure includes an Environmental Protection Agency and an Environmental Quality Council to serve as a sort of grand jury and to make recommendations to the governor. (See also W74-05651) (Weaver-Wisconsin)
W74-05655

FLORIDA'S RATIONALE FOR COASTAL ZONE MANAGEMENT,
Florida Dept. of Natural Resources, Tallahassee. Coastal Coordinating Council.
F. Barloga, L. Burney, and B. Johnson.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida, p 62-67, 1972.

Descriptors: *Florida, *Environmental effects, *Water resources development, *Comprehensive planning, Management, Natural resources, Coasts, Preservation, Conservation, Land use, Zoning, Compatibility.

Identifiers: *Florida Coastal Zone Master Plan, Development.

Because the coastal zone is Florida's most important asset, great care must be taken in choosing tools to alleviate adverse effects of coastal development. Currently existing tools which provide potential for effective coastal zone management are essential but inadequate to accomplish their goal. The Florida Coastal Coordinating Council created in 1970 presents the first opportunity for state level research, coordination and planning necessary for orderly development and optimum use of coastal areas. The council will plan maintenance and improvement of environmental quality and encourage joint use of resources by compatible activities or provide for allocation of exclusive use by non-compatible activities to maximize the retention of options for the future. Preliminary accomplishments and problems encountered by the council are reviewed. (See also W74-05651) (Weaver-Wisconsin)
W74-05657

CAN COASTAL RESOURCES SURVIVE DEVELOPMENT,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
B. J. Yokel, and D. C. Tabb.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida, p 68-71, 1972. 1 fig.

Descriptors: *Florida, *Habitat improvement, *Wildlife conservation, Environmental effects, Management, Land use, Permits, Coordination, Conservation, Planning, Aesthetics.
Identifiers: *Coastal Zone management, Real estate development, Compatible use.

Coastal bay bottom, estuarine, and marshland development, once encouraged by policy, has become subject to tighter control as the ecological role of these coastal systems has become better understood. A plan for statewide coastal management is being developed by the Coastal Coordinating Council of the Florida Department of Natural Resources. However, as an example of privately initiated alternatives for coastal management in the absence of the Coastal Coordinating Council, the case of the establishment of the Rookery Bay Sanctuary by the efforts of a small group of concerned citizens is reviewed. Organization, initiated in response to private real estate development plans, led to a substantial grant by the National Audubon Society and the establishment of the Sanctuary, not only as a preserve, but as a field area for multidisciplinary study of effects of upland development. (See also W74-05651) (Weaver-Wisconsin)
W74-05658

STATE-FEDERAL MANAGEMENT INITIATIVE,
National Marine Fisheries Service, St. Petersburg, Fla. Southeast Region.
R. T. Whiteleather.
In: Proceedings of the 24th Annual Session Gulf and Caribbean Fisheries Institute, November 1971, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Coral Gables, Florida, p 72-74, 1972.

Descriptors: *Management, *Marine fisheries, *State governments, *Federal government, Commercial fishing, Regulation, Legislation, Economics, Social aspects, Fish conservation.
Identifiers: *Marine resources, *Coastal Zone management, International exploitation, Limited entry.

The National Oceanic and Atmospheric Administration has been assigned responsibility for conservation and wisest utilization of the total living marine resource. In the organization's restructuring to deal with the complex assignment, State-Federal fishery management iniative is a key approach designed to develop cooperative management plans. Migratory marine fisheries would be under national management, while states would have greater responsibility for regulation of fisheries within their contiguous fishery zone. Implementation of the initiative will involve careful delineation of international, national, and state guidelines for fishery management and the careful investigation of alternative state and/or federal management systems. Preliminary efforts have already begun, but resolution of implementation problems is expected to require several years of research. Several fundamental problems in this area are mentioned. (See also W74-05651) (Weaver-Wisconsin)
W74-05659

INTERNATIONAL MANAGEMENT OF THE RIO GRANDE BASIN - THE UNITED STATES AND MEXICO,
University of Western Ontario, London. Dept. of Geology.
For primary bibliographic entry see Field 4A.
W74-05664

WATER-MANAGEMENT PROBLEMS RELATED TO GROUNDWATER RIGHTS IN THE SOUTHWEST,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W74-05683

THE STRUCTURE OF MANAGEMENT AND PLANNING FOR THE COASTAL ZONE,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W74-05702

SEWAGE WORKS OF MUNICIPAL CORPORATIONS AND SANITARY DISTRICTS,
W. Va. Code Ann., Secs. 16-13-1 through 16-13-8 (1967).

Descriptors: *West Virginia, *Legislation, *Waste treatment, *Supervisory control, *Environmental sanitation, Water quality control, Public health, Sewage treatment, Waste disposal, Waste water, Waste water treatment, Administrative agencies, Structures, Municipal wastes, Discharge, Drainage, Water pollution treatment, Pollution control, Pollution abatement, Legal aspects.

Municipal corporations and sanitary districts are authorized to own, acquire, construct, equip, operate and maintain sewage collection systems, sewage treatment plants, intercepting sewers, outfalls, and all other appurtenances necessary or useful for the collection, treatment, purification and disposal of the liquid and solid wastes of such municipal corporations or sanitary districts. A sanitary board shall be appointed to supervise the construction, acquisition, equipment, operation and maintenance of any such works for the collection, treatment and disposal of sewage and the collection of revenuse derived from those services. The board shall also have the power to hire personnel, enter contracts, make improvements, extensions and replacements of existing public works. In addition the board may also acquire property necessary to carry out its statutory functions. (Silber-Florida)
W74-05745

PUBLIC SERVICE DISTRICTS FOR WATER AND SEWERAGE SERVICES.
W Va Code Ann, secs 16-13a-1 through 16-13a-9 (1953).

Descriptors: *West Virginia, *Legislation, *Citie *Waste treatment, *Water quality control, Sewa disposal, Sewage treatment, Treatment facilitie Municipal wastes, Municipal water, Was disposal, Environmental sanitation, Environme tal engineering, Administrative agencies, Stru tures, Water resources.

The formation of public service districts authorized in any territory constituting the wh or any part of one or more counties. The purpo of the districts is to preserve the public health purchase, construction, maintenance, or operati of properties supplying water or sewerage servic within such territories. The district, when form shall be a public corporation and political subdi sion, but without any power to levy or collecte valorem taxes. Each district may acquire, own a hold property, hire personnel, enter contracts a enter into agreements for furnishing wholes water supply for distribution. Whenever such d trict shall have constructed, acquired established water or sewer facilities for servic within any given area, no city, incorporated tow or other municipal corporation shall thereaf construct, acquire or establish any facilities of t same kind within such area without the consent such district. The district shall also establish ra and charges for the services and facilities furnishes. (Silber-Florida)
W74-05746

A BILL TO AUTHORIZE A PROGRAM DEVELOP AND DEMONSTRATE LOW-CO MEANS OF PREVENTING SHORELINE ER SION.
Senate Bill 19, 93d Cong, 1st sess (1973).

Descriptors: *Inter-agency cooperating, *Fede project policy, *Erosion control, *Diversion str tures, *Administration, Bank erosion, Legislati Federal government, Water resources devel ment, Inter-agency comm. on water resourc Project purposes, Water policy, Research a development, Water resources, Coastal engine ing, Coastal structures.

This bill is a plan to develop, demonstrate, and d seminate information about low-cost means combat shoreline erosion. The program will be ministered by the Department of the Army cooperation with the Agriculture Department consist of planning, constructing, operati evaluating and demonstrating prototype shorel erosion control devices, both engineered vegetative. Demonstration projects sh emphasize the development of low-cost shoreli erosion control devices located on sheltered or land waters, reflecting a variety of geographi and climatic conditions. An advisory panel is to set up consisting of knowledgeable representati from various geographical areas and experts fields of significance to this work. The panel sh advise generally, recommend site criteria, revi progress periodically, and recommend dissemi tion means. The Secretary of the Army shall s mit an annual report to the House Public Wo Committee and the final report shall include comprehensive evaluation of the natio shoreline erosion control development progr (Sutton-Florida)
W74-05747

NATURAL AREAS PRESERVATION.
Tenn Code Ann, secs 11-1701 thru 11-1715 (197

Descriptors: *Tennessee, *Legislati *Administration, *Protection, *Conservati *Proprietory power, Law enforcement, St governments, Recreation, Federal governme Management, Planning, Penalties(Legal), Le aspects, Natural resources.
Identifiers: Scenic easements.

The purpose of natural areas preservation is protect those areas which are in peril of be

stroyed or substantially diminished by polluting tivities. The Act was promulgated since there is been no protective regulation until this one. he Act provides for administration by the depart- ent of conservation together with the game and esh water fish commission. There shall be two assifications of areas, one for scenic-recrea- onal areas, another for natural-scientific areas d premitted uses in each shall be limited to foot ails, scienic vistas, and small picnic areas. How- er in the second class, at the Commissioner's scretion, such use can be limited further. An an- ual report is required, the legislature will signate the areas, and a two year period is given r initial development. Power to acquire lands d waters is given to the Comimissioner in the me of the State, preferably to acquire scenic sements. Finally, cooperation and reports of her agencies are requested and private areas are be registered and maintained. The penalty for olators is to be levied at $100 per day, such viola- ns to be prosecuted by district attorneys- neral. (Sutton-Florida)
74-05748

NLAWFUL SEWAGE DISPOSAL.
nn Code Ann secs 39-2209 thru 39-2211 (1955).

escriptors: *Public health, *Legislation, ewage disposal, *Administration, enalties(Legal), Tennessee, Law enforcement, cal government, Water pollution control, Pollu- nt identification, Water pollution sources, wage effluents, Water pollution, Effluents, In- strial wastes, Water wells.

shall be unlawful for any person, organization, rtnership, corporation or other entity to dispose water carrying human waste, household or busi- ss waste, or to pipe or transmit raw sewage or e effluent from any septic tank or other sewer stem, into any abandoned well, cave, sink hole, en ditch or any well drilled or dug for the pur- se of disposing of sewage. It shall be the duty of e local health officers to enforce these provi- ns. Any person or entity violating these provi- ns shall be guilty of a misdemeanor, and each y of continued violation, after conviction, shall nstitute a separate offense. (Ritchie-Florida)
74-05749

ILL SUCCESS SPOIL NEPA,
Zeldin.
udubon, Vol 74, No 4, p 106-111, July 1972. 1 s.

scriptors: *Statutes, *Federal government, ourt decisions, *Political aspects, Industries, sthetics, Permits, Administrative agencies, cision-making, Local governments, Public alth, Environmental sanitation, Social need, So- l value, Environment, Environmental effects, gulation.
ntifiers: *Environmental impact statement, ational Environmental Policy Act, Stand- (Legal), Public trust doctrine, Sovereign immu- y, Citizen lawsuits.

e National Environmental Policy Act (NEPA) uired all federal agencies to prepare an environ- ntal impact statement on any proposed action nificantly affecting the quality of the human en- onment. This law worked well toward creating zen lawsuits. Piqued citizen suits and prodded its industry friends, the government has tried to p environmentalists from having their day in rt. The government often argues standing and reign immunity, and also attempts to have h bonds set to make it financially impossible for anizations to undertake court action. But the rts have sustained enough citizen lawsuits to ke it a weapon to be feared. Many federal agen- s and some members of Congress prefer to have iness as usual without outside interference. s has produced an environmental backlash: (1) House passed a bill allowing the Atomic Ener- gy Commission (AEC) to issue licenses for nuclear plants without studying their environmental im- pact; (2) Nixon administration proposals to create loopholes in the NEPA; and (3) restrictions on citizen court suits. The administration has at- tempted to pit environmental objectives against economic objectives and show their incompatibili- ty. The 1899 Refuse Act is the major government enforcement tool and perhaps because of this, is endangered by pending bills. Until there is an ef- fective national program of legislation and en- forcement, individual citizens and public groups must be able to go to court and push agencies and legislators into action. (Sperling-Florida)
W74-05750

SOIL AND WATER CONSERVATION.
Minn Stat Ann, secs 40.01, 40.02 (Supp 1973), as amended, ch 412, sec 9 (1973) Laws of Minn.

Descriptors: *Land development, *Soil erosion, *Soil conservation, *Soil management, *Water resources development, *Land use, Minnesota, Legislation, Administration, Recreational development, Erosion control, Land development, Wildlife, Land resource development, Siltation, Flood control.

The public policy is to provide for the conservation of the soil resources of the state of Minnesota and to control and prevent soil erosion through land resource planning and development. Improper land use and failure of land occupiers to change their methods are the reasons for such legislation. The Act sets forth ways to rectify the situation by implementing land use practices that will effectively reduce siltation and loss of land base through activities associated with farming, mining, construction and forestry. The Act is also aimed at flood prevention and the conservation, development, utilization, and disposal of water, included but not limited to measures for fish, wildlife and recreational development. (Sutton-Florida)
W74-05751

MUNICIPAL WATER POLLUTION CONTROL--STANDARDS OF QUALITY AND PURITY.
Minn Stat Ann, sec 115.44 (Supp 1973), as amended, ch 374, secs 15, 16 (1973) Laws of Minn.

Descriptors: *Water pollution, *Water quality standards, *Water pollution control, *Water resources development, Legislation, *Minnesota, Water law, Legal aspects, Municipal governments, Public health, Administrative agencies, Sewage effluents, Water pollution sources.

These amended sections are aimed at attaining the objectives established by the statutes dealing with water pollution and water quality. The Minnesota pollution control agency is given the power, whenever practical and advisable, to establish standards specifying quality and purity or maximum permissible pollutional content of effluent, without regard to water quality standards. There are two provisos regarding this new power; that such new standards will assure the protection and propagation of a balanced, indigenous population of fish and wildlife in the body of water and that any point source of a discharge having a heat component shall not be subject to more stringent effluent limitations, with regard to that heat component that those previously established for such facility. The statute deals with conflicts between state laws and similar federal provisions and compliance with such state laws are waived to the extent necessary to enable the agency to comply with federal laws, rules, and regulations. (Sutton-Florida)
W74-05752

WATER POLLUTION CONTROL--ENFORCEMENT.
Minn Stat Ann, sec 115.071 (Supp 1973), as amended, ch 374, sec 13 (1973) Laws of Minn.

Descriptors: *Water pollution control, *Water quality standards, *Enforcement, *Remedies, Statutes, Water law, Legal aspects, *Minnesota, Administrative agencies, State jurisdiction, Adjudication procedure, Water quality control, Water resources.

Listing various remedies available, including criminal prosecutions, civil penalties, injunctions and actions to compel performance, the amended statute deals with the enforcement of water pollution control laws. The criminal provisions distinguish between wilful and negligent actions. Although the maximum limits of not more than $25,000 per day in violation of a law or order and/or imprisonment of up to one year are the same in both categories, and the statute also provides for harsher penalties for further convictions, the statute further provides for criminal penalties where there is tampering with monitoring and information devices, and designates the enforcement duties. Civil penalties are then outlined, as well as acceptable defenses for violative actions and all actions are to be brought by the attorney general in the name of the state. Injunctions can be issued against such action if they would create a public nuisance and again are to be sought by the attorney general. In actions to compel performance, private defendants adjudicated responsible may be compelled to do and perform any and all acts within their power reasonably necessary to accomplish the order's purpose. The statute also covers actions in which the defendant is a municipality or other governmental agency. (Sutton-Florida)
W74-05753

DRAINAGE.
Minn Stat Ann, sec 106.021 (Supp 1973), as amended, ch 479, secs 4, 5, 6, 7 (1973) Laws of Minn.

Descriptors: *Minnesota, *Drainage engineering, *Drainage systems, *Flood control, *Water works, *Local governments, Surface waters, Water management(Applied), Water control, Water distribution(Applied), Regulation, Drainage programs, Administrative agencies, Administration, Legislation, Drainage districts.
Identifiers: *Administrative regulations, Fill permits, Licenses.

Power is conferred on the county boards and district courts to make all necessary orders for the construction and maintenance of public drainage systems. These drainage systems can be extended into or through any municipality to find an outlet. No lake will be drained or natural water course channelized if it is a part of the public waters of the state. These same measures can be taken for flood control except that public waters cannot be affected without approval of the Commissioner of Natural Resources. The petitioners for any public ditch, or the county board or court may ask for the commissioner's approval. The commissioner is to make a list of criteria for the board and court to consider when establishing and improving drainage systems. The criteria are to relate to the social, economic, and environmental impact of the proposed drainage system. The criteria will be limited to the following: cost-benefit analysis, public and private; analysis of present and future agricultural land acreage; flooding characteristics of project lands; alternative measures; water quality effects of the project; effects on fish and wildlife resources; and the overall environmental impact. (Sperling-Florida)
W74-05754

FLOOD PLAIN MANAGEMENT.
Minn Stat Ann, secs 104.01 to 104.07 (Supp 1973), as amended, ch 412, sec 10, ch 351, secs 1-8 (1973) Laws of Minn.

Descriptors: *Water yield improvement, *Water supply, Water resources development,

*Watershed management, *Flood plains, *Minnesota, Nonestructural alternatives, Flood protection, Flood plain zoning, Flood control, Erosion control, Flood damage, Legal aspects, Water law, Legislation.

Reducing flood damages through flood plain management, stressing nonstructural measures including flood plain zoning, flood proofing and flood warning practices constitutes the Minnesota statute's purpose. In furtherance of this goal, flood plain management ordinances are to be considered first and local governmental units must adopt them before seeking alternative methods. The powers are given to the commissioner of natural resources, who shall conduct periodic inspections to determine the effectiveness of local programs, including an evaluation of the enforcement of and compliance with, local flood plain management ordinances. Due consideration is to be given to the needs of an industry whose business requires it to be located within a flood plain. When the commissioner determines that sufficient technical information is available for the delineation of flood plains and floodways on a watercourse, he shall notify affected governmental units that such information is available. Every structure, fill and deposit, placed or maintained in violation of an ordinance shall be considered a public nuisance and may be enjoined. Such violation exists shall be a separate offense. (Sutton-Florida)
W74-05755

WATER RESOURCES MANAGEMENT.
Minn Stat Ann, secs 378.31, 378.32 (Supp 1973), amended, ch 702, secs 4, 5 (1973) Laws of Minn.

Descriptors: *Water resources, *Water resources development, *Project purposes, *Water conservation, *Local governments, Statutes, Water law, *Minnesota, Water supply, Administrative agencies, Land resources, Water users, Watershed management, Water yield improvement, Interagency cooperation.

To enhance the use and enjoyment of Minnesota's lakes, a statewide improvement program is established to preserve the natural character, improve water quality, provide for water quantity and to assure protection of the lakes from man's detrimental activities and certain natural processes. The power to enforce the sections of the statute is given to the county board and all programs undertaken pursuant to such powers shall be consistent with statewide water and related land resources plans. Powers shall include acquiring any existing dam or control works by various means, projects to change course current, and to construct and operate water control structures. Further, the county board may undertake research to determine the condition and development of the body of water and water entering it by developing a comprehensive plan to eliminate water pollution. Other related powers are also listed, including water surface use regulation by ordinances and such proposed zoning ordinances shall be submitted to the commissioner of natural resources for approval. The board's broad powers also include regulating and policing public beaches, regulating construction and maintenance of commercial marinas and related facilities and all other structures associated with the state's water resources. (Sutton-Florida)
W74-05756

POLLUTION CONTROL AGENCY.
Minn Stat Ann, secs 116.21 to 116.29, 116.32 to 116.35 (Supp 1973).

Descriptors: *Pollutants, *Water pollution control, *Water pollution sources, *Water treatment, *Water conservation, *Minnesota, Legislation, Administration, Administrative agencies, Detergents, Phosphates, Water quality, Control, Water supply, Water quality control, Legal sanctions, Eutrophication.

This Minnesota statute seeks to encourage the state pollution control agency to set standards limiting the amount of nutrients in various cleaning and water conditioning agents, as they eventually lead to an acceleration of the natural eutrophication process of the state's water. Limitations imposed should be made taking several factors into consideration, including the availability of safe, nonpolluting and effective substitutes, the difference in the mineral content of waters, and the differing needs of industrial, commercial and household users. The Act requires certain tests for percentage content of phosphates in laundry or dishwashing compounds and the display of lists setting forth the percentage content in certain products. Seizure of cleaning agents or chemical water conditioners is provided for and after conviction of a violation, provisions are set up for forfeiture and disposal of the compounds. In addition to penalties, the court may order those persons to refrain from any further violations or to cease operation. (Sutton-Florida)
W74-05757

WATER POLLUTION--CLASSIFICATION OF WATER SUPPLY AND WASTE WATER TREATMENT FACILITIES.
Minn Stat Ann, secs 115.71 to 115.82 (Supp 1973).

Descriptors: *Water pollution, *Water supply, Waste water treatment, *Treatment facilities, *Water conservation, *Minnesota, Legislation, Administration, Waste disposal, Public health, Water resources, Water policy, Legal aspects, Water law, Administrative agencies.

Minnesota enacted this statute for the protection of public health and the conservation and protection of water resources. It classifies all public water supply systems and all public waste water treatment facilities and these classes shall be based on the degree of hazard to public health together with the type and loading of plant and the population served or the average population equivalent of the sewage handled. The Act sets up a board of certification which shall issue certificates for operation, to operators meeting such competency and examination standards as may be set up. In certain cases, such certificates may be issued without examinations. A fee schedule and payment procedure is outlined, as well as the board's power, and an effective violation date set. Violations are considered separate offenses and classified as a misdemeanor. (Sutton-Florida)
W74-05758

CONSTRUCTION, RECONSTRUCTION OR MAINTENANCE OF DRAINS.
Ind Ann Stat secs 27-2101 thru 27-2166 (1970).

Descriptors: *Indiana, *Drainage, *Legal aspects, *Legislation, *Drains, Drainage systems, Urban drainage, Controlled drainage, Statutes, Assessments, Drainage engineering, Controlled drainage, Drainage systems.

These statutes relate to the construction of new drains, reconstruction of drains, periodic maintenance and annual assessments. Included are annotations of decisions under prior law. The article on construction of new drains details the petition procedure, the requirements for hearings, the contents of the surveyor's report, the appeal procedure for rejected petitions, remonstrances to petitions, the final report and a schedule of assessments for improvements. The article on reconstruction of drains describes the surveyor's report, schedules of assessments and damages for reconstruction, hearings, grounds for objection and appeal. The section on periodic maintenance and annual assessments deals with drains classified in need of periodic maintenance, maintenance report and schedule of assessments, hearings, time of filing objections, use of maintenance fund for drains, omission of assessment when authorized and minimum annual assessments. (Sears-Florida)
W74-05759

CITY OF KINGS MONTAIN V. GOFOR (CITY FILES PETITION FOR CONDEMN TION OF BOTTOM LAND AND CONDEMNE CROSS COMPLAIN FOR DESTRUCTION PROPERTY DUE TO FLOODING CAUSED DAM).
196 S E 2d 231-239 (N C 1973).

Descriptors: *North Carolina, *Surface wat *Obstruction to flow, *Barriers, *Streamfl *Condemnation, *Legal aspects, Eminent dom Crops, Flooding, Dams, Riparian rights, W law, Flood damage, Overflow, Alteration of fl Riparian land.

Municipal corporation filed petition for c demnation of certain bottom land and condemn filed cross complaint seeking recovery for destr tion of crops on the bottom land allegedly du flooding caused by dam. Held: if condemn were owners and entitled to possession of l when crops were planted and flooded, evidenc to brief floodings prior to construction of c demnor's downstream dam, as compared with tended flooding and destruction of crops on occasions after construction of dam, was su cient for submission to jury as to whether or condemnor was liable for destruction of crops to flooding. It was therefore error to grant nicipal corporation's motion for directed ver of dismissal of condemnee's cross action. A lo owner cannot obstruct surface stream of wat as to prevent water from flowing as it natur would and thereby flood lands and buildings ab him, and if he does so he incurs liability damage done by such flooding. (Sears-Florida)
W74-05760

A BILL TO BE ENTITLED AN ACT RELATI TO COASTAL ZONE MANAGEMENT.
Fla House Bill No 158 (February 1973).

Descriptors: *Florida, *Legislation, *Co *Land management, *Land use, Aquatic anim Shellfish, Ecology, Environment, W resources, Wildlife, Nutrients, Erosion, W utilization, Shores, Coastal marshes, Swa Wetlands, Aquatic habitats, Estuaries, Water lution, Water pollution control, Land deve ment.

It is the declared public policy of Florida preserve, protect, develop and where possible restore or enhance the resources of the st coastal zone. An agency designated by the go nor shall develop a management program w shall include an identification of the boundari the coastal zone, a definition of what shall stitute permissible land and water uses within zone, and finally an inventory and designati areas of particular concern within the coa zone. Local governments having jurisdiction i area of the coastal zone will submit land deve ment regulations to the state agency for appro Once approval has been granted, amendmen rescission of those rules must again obtain proval of the state agency. These rules and re tions will roughly divide the coastal zone preservation, conservation and development a in which no development, limited develop and intensive development will be permit respectively. These areas will be determine cording to the classes of water they contain defined by the rules of the department of poll control. In addition, the agency may adopt re for the acquisition, development and operati estuarine sanctuaries for the purpose of cre natural field laboratories. (Ritchie-Florida)
W74-05761

COASTAL ISLAND TRUSTS.
Me Rev Stat Ann tit 12 sec 641-646 (Supp 1973

Descriptors: *Environment, *Isla *Development, *Maine, Coasts, Environme control, Resources, Legislation, State gov

ents, Coastal structures, Recreation, Environ-
ental effects.
entifiers: Coastal island trusts, Public trust doc-
ne.

ıe purpose of this chapter of the laws of Maine is
provide a means whereby state and local offi-
ıls, together with federal officials can take ac-
ın, when appropriate, to protect and manage the
astal islands or groups of coastal islands of the
ıte of Maine. Such protection is to serve the best
:erests and needs of all the citizens for con-
ılled commercial development and sanctuaries
r reaction and relaxation in a manner consistent
th the maintenance and improvement of the
astal island environment. For this purpose, a
astal island trust was established with a commis-
ın to oversee those islands included by the
gislature, for their protection and proper main-
ıance. The commission is to develop and main-
n a comprehensive plan to preserve, restore,
d utilize the commercial, natural, scenic, histori-
l, and recreational values of the coastal islands.
aniels-Florida)
74-05762

IVIRONMENTAL LAW--RIVERS AND HAR-
ORS APPROPRIATIONS ACT--PRIVATE PER-
NS MAY NOT SUE IN QUI TAM WITHOUT
PLICIT GRANT OF PERMISSION FOR
TIZEN SUITS.
rdham University Law Journal, Vol 1, p 480-
2, 1973. 63 ref.

scriptors: *Legal aspects, *Legislation, *Rivers
d Harbors Act, Federal Water Pollution Control
t, Water Law, Water pollution, Water pollution
ıtrol, Common Law, Law enforcement.
ntifiers: Qui tam action.

action brought by an informer, under a statute
ich establishes a penalty for the commission or
ission of a certain act, and provides that the
ne shall be recoverable in a civil action, part of
penalty to go to any person who will bring such
ion and the remainder to the state or some other
titution, is called a 'qui tam action' because the
intiff states that he sues as well for the state as
himself. It has been held that private persons
ınot sue in qui tam under the Rivers and Har-
's Act, even when the Justice Department fails
refuses to initiate proceedings in accordance
h the Act. Since there is no common law right
maintain a qui tam action, the right must be
ated by statute. The Refuse Act does not creat
h a right. Legislation authorizing qui tam ac-
is is needed. Important considerations are
iticiability and standing. This need may have
n met by the Federal Water Pollution Control
Amendments of 1972. (Sears-Florida)
4-05763

STE DISCHARGE PERMITS: NO DEFENSE
WATER POLLUTION ACTIONS,
vis and Clark Coll., Portland, Oreg.
thwestern School of Law.
primary bibliographic entry see Field 5G.
4-05764

UNTY OF FREEBORN V. BRYSON
CLARATORY JUDGMENT ACTION CON-
RNING PORTIONS OF A NATURAL WIL-
FE MARSH).
N W 2d 290-297 (Minnesota 1973). 8 p.

criptors: *Minnesota, *Environmental effects,
ghway effects, *Wildlife habitats, *Wetlands,
ural resources, Construction, Ecosystems,
demnation, Marshes, Protection, Environ-
t, Judicial decisions, Legal aspects, Public
ts, Highways, Road construction.
itifiers: Environmental Rights Act.

is an action under the Minnesota Environ-
tal Rights Act in response to condemnation proceedings initiated for the purpose of acquiring certain lands for construction of a highway. The main issue on appeal concerned the limitations on the country's power to condemn land for a public use. The plaintiffs owned the farmland which contained marsh lands and wetlands. Experts testified that the area provides a unique natural ecosystem or environment because of its capacity to support a great diversity of life. The defendant county proposed to condemn a strip of the farm for construction of a highway. Expert witnesses gave opinions that the construction would have significant detrimental effect on the area's value as wildlife area. The court held that under the Act, any person may maintain an action for declaratory or equitable relief for protection of natural resources; that the act limits condemnation for public highways; that material evidence could be shown to establish a prima facie case of adverse effects on the environment; and that the county could rebut by showing no proven or feasible alternative or that its conduct was in the public's interest. (Daniels-Florida)
W74-05765

WILDERNESS PRESERVATION II: BRINGING THE CONVENTION INTO COURT,
Environmental Law Inst., Washington, D.C.
T. Guilbert.
Environmental Law Reporter, Vol III, No 6, p 50044-50050, June 1973. 65 ref.

Descriptors: *International law, *Conservation, *Protection, Wildlife management, Wildlife conservation, Legal aspects, Environmental effects, Ecology, Treaties, Judicial decisions, Wildlife, Wildlife habitats.
Identifiers: *Injunctive relief, *Convention on Nature Protection and Wildlife Preservation, *Organization of American States.

The Convention on Nature Pretection and Wild Life Preservation in the Western Hemisphere is an agreement between the member nations of the Organization of American States (OAS) to maintain strict wilderness reserves inviolate. In many environmental protection suits, the Convention may well provide independent grounds for a decision to enjoin activities which would have detrimental effects on wilderness areas. If the judge decides to protect the wilderness area in question, it is simple for him to invoke the Convention's edict by merely citing the supremacy clause of the United States Constitution which makes treaties the supreme law of the land. There may be difficulties, however, in demonstrating to a court that it is the court's non-discretionary duty to give effect to the convention. It must be shown that the area satisfies all of the criteria for strict wilderness reserves, that the area is either listed as a wilderness reserve with the OAS or that its non-listing has no legal effect, that there is standing to invoke the Convention in this litigation, and that the use sought to be prevented is not 'consistent with the purposes for which the area was established.' (McKnight-Florida)
W74-05766

A BILL AMENDING THE PUBLIC HEALTH SERVICE ACT AND THE FEDERAL FOOD, DRUG, AND COSMETIC ACT IN ORDER TO ASSURE SAFE DRINKING WATER.
House Bill 1059, 93rd Cong, 1st sess (1973). 30 p.

Descriptors: *Potable water, *Water quality standards, *Public health, *Legislation, Governmental interrelations, Federal government, Government finance, State governments, Administrative agencies, Regulation, Water quality.
Identifiers: Notice.

The Administrator of the Environmental Protection Agency shall publish proposed national primary drinking water regulations within 180 days after the enactment of this title, and he shall publish proposed national secondary drinking water regulations within 270 days after such enactment. Primary drinking water standards shall specify the maximum permissible level in water of each contaminant which in the judgment of the Administrator may have any adverse effect on the health of persons and shall contain criteria and procedures to assure a supply of drinking water which dependably meets the standards promulgated by the Administrator. The states are given primary enforcement responsibility for the public water systems but if the Administrator determines that any public water system in any state does not comply with the national primary standards, he may after 30 days give notice to such state and subsequently commence a civil action. Notwithstanding any other provision of the title, the Administrator, upon receipt of information that a contaminant which is present in or is likely to enter a public water system may present an imminent danger, may immediately take such actions as he may deem necessary. (McKnight-Florida)
W74-05767

COUNTY CONTROL OF DAM CONSTRUCTION.
Mich Comp Laws Ann, sec 46.22 (Supp 1973).

Descriptors: *Michigan, *Dam construction, *Dam design, *Administrative agencies, *Permits, State governments, Navigable rivers, Water law, Legislation, Regulation, Dams, Engineering structures, Bypasses.

If any person desires to construct a dam, a specification. A new section of this statute provides that any permit to build a request to construct the dam must be presented to the board of supervisors, for their approval, setting forth the dam's dam across a navigable stream shall provide for an easement to the public for an adequate and proximate right of way for the portage of small craft around the dam. Notice of the petition must be published at least three weeks in advance of a mandatory hearing. All owners of land affected must be notified by registered mail. The board has no power to grant the right to anyone to take or injure the lands of another, or to abrogate any requirements set forth in the statutes in the consequence of building the dam. The board must send a copy of any petition for permission to build a dam to the secretary of the natural resources commission along with notice of the time and date of hearing. (Flowers-Florida)
W74-05768

SMITH V. CRUTHIS (INJUNCTION TO PROHIBIT LEVEE AND TO RECOVER FOR CROP DAMAGE).
499 S W 2d 852 (Ark 1973).

Descriptors: *Arkansas, *Levee, *Dike, *Surface runoff, Legal aspects, Judicial decisions, Flood protection, Earthworks, Controlled drainage, Surface drainage, Drainage water, Surface runoff.
Identifiers: Injunctive relief.

This suit primarily concerned a common boundary line. The plaintiffs alleged that the defendant came on their side of the line and erected a levee which obstructed the natural drainage of the plaintiffs' land. The plaintiffs asked for a permanent injunction to prohibit the defendants from maintaining the levee. The plaintiffs also asked for crop damages caused by the flooding. The defendant affirmatively alleged that the plaintiffs dug a ditch across their lands to speed the flow of surface water and create a lake for duck hunting. The defencant maintained that the plaintiffs' damages resulted from the plaintiffs' failure to keep the ditch unobstructed. The defendant also claimed damages for the plaintiffs' cutting his dikes and levees which he contended were on the boundary line, destroying his rice crop. The court first fixed the boundary line and found that the flume protruded in some places on the plaintiffs' property. The court directed that the flume, and levee be

removed where it so infringed. The court stated that a landowner had the right to fend off surface waters by maintaining a flume and levee upon his own lands, but not on the land of others. (Sperling-Florida)
W74-05770

BEACH AND SHORE PRESERVATION ACT.
Fla Stat Ann secs 161.052, 161.141, 161.151, 161.161, 161.171, 161.181, 161.191, 161.201, 161.211 (Supp 1973).

Descriptors: *Florida, *Beaches, *Shore protection, *Beach erosion, *Riparian rights, Riparian land, Harbors, Piers, Coastal engineering, Legislation, Erosion control, Public benefits, Coasts, Erosion, Coastal structures, Piers, Beaches, Common law, High water mark, Boundaries(Property), Legal aspects, Public rights.
Identifiers: *Administrative regulations, *Coastal waters, Ingress, Egress.

Coastal construction by persons, firms, corporations or local authorities is restricted. All construction is prohibited within fifty feet of the mean high water line at any riparian coastal location. An exception may be obtained by filing an application showing engineering data, shoreline stability, storm tides, and the nature of neighboring structures. Piers may be built unless they will cause erosion. Additionally, these regulations are only applicable to sandy, not vegetative shores. Any coastal structure in violation of this act is considered a public nuisance. The statute also provides that beach restoration projects be undertaken if severe beach erosion has occurred, and if the beach will be destoryed in the immediate future. When such a beach is restored, the added land belongs to the state, but the common-law rights of riparians are preserved. No structure will be permitted to be built on the new land except those required for erosion prevention. Neither shall any use be permitted which may be injurious to the property or the landowners business or person. (Sperling-Florida)
W74-05771

WATER POLLUTION--PENALTY PROCEEDINGS.
Vt Stat Ann, Title 18, sec 1213. (1951).

Descriptors: *Vermont, *Legislation, *Water law, *Water quality control, *Water resources, Pollution, Water pollution control, Water purification, Water policy, Water pollution treatment, Waste water, Waste water disposal, Sewage treatment, Sewage disposal, Water treatment, Nuclear wastes, Water supply, Water wells, Spring waters.

A person who willfully dumps, deposits or places excrement, garbage, refuse, sewage, sewage sludge, radioactive wastes, petroleum products, or any poisonous substances into a water well or spring, whether the well or spring is in use or not, shall be fined not more than $5,000.00 or imprisoned for not more than five years, or both. This does not preclude the use of any disinfectant or other substance to improve the quality of the well or spring water for drinking. (Silber-Florida)
W74-05772

HEALTH-MUNICIPAL WATER TREATMENT PLANTS.
Vt Stat Ann Title 18 sec 1221 (1970).

Descriptors: *Vermont, *Legislation, *Water supply, Water utilization, *Water treatment, Water purification, Water resources planning, Water quality, Water quality control, Water management, Water conditioning, *Treatment facilities, Environmental engineering, Structures, Cities, Filtration, *Public health, Equipment.

After a public hearing, if it is found that any public water supply is likely to be contaminated, or if waters designated as Class A are reclassified by order of the water resources board, the board of health shall order the municipality or person using or supplying such public water supply to construct and install filtration and disinfection facilities in order to protect the public health or else convert to a new source of public water supply. Any such order shall specify a reasonable time schedule for such construction or conversion and shall specify and interim measures necessary for the protection of the public health. (Silber-Florida)
W74-05773

CHAMPLAIN BASIN COMPACT.
Vt Stat Ann tit 10 secs 171-172 (1967).

Descriptors: *Legislation, *Water law, *Water resources, *Vermont, Conservation, Scenery, Management, Water resources development, Water utilization, Natural resources, Water control, Waste disposal, Navigable waters, Dredging, Filling, Groundwater, Industrial water, Recreation, Resources planning, Lakes, Land use, Land development, New York.
Identifiers: *Lake Champlain basin.

The state of Vermont is authorized to join with the state of New York in a common effort to promote the sound development of the underdeveloped resources of the Lake Champlain Basin. The parties agree that the conservation, utilization, development, management and control of the water and related resources is essential for the public welfare. The commission created by the act shall act as a general forum for the problems of the region, devise solutions to these problems and implement intergovernment coordination and cooperation within the region. It shall also cooperate with the appropriate agencies in regional development, tourism, festivals, exhibitions as well as plan and recommend governmental services which will aid in the growth and prosperity of the region. The commission may also conduct water resources research including the relation of water to other resources, industrial water technology, ground water movement, water demand and general hydrological conditions. The commission shall design a plan for the development of the basin's resources to safeguard its scenic value, including the establishment of Lake Champlain Park. The commission may also regulate advertising, objectionable uses of property, dredging, filling, sewage disposal and navigation within the region. (Silber-Florida)
W74-05774

SOIL AND WATER CONSERVATION--FLOOD CONTROL.
Vt Stat Ann Title 10, secs 401-408 (1968).

Descriptors: *Legislation, *Control, *Coordination, Operations, *Benefit sharing, Administrative agencies, Administration, Conservation, Resources planning, Natural resources, Adoption of practices, *Vermont, Financing, Budgeting, Land, Water, Wildlife, Public health, Resources development.

The Vermont state natural resources conservation council was created to provide for the conservation, development and use of the natural resources of the state. The council may employ an administrative officer and such technical experts and other agents and employees as it may require. The council shall allocate funds to the various districts based on their operating expenses and individual conservation needs. The council shall also disperse the necessary funds needed to operate the various supervisory unions in facilitating their programs and operations. The districts and unions shall submit semi-annual fiscal and expenditure reports to the council. In addition, the council shall offer assistance to the directors of the districts and unions, coordinate interagency cooperation, secure the cooperation and assistance of the United States and any of its agencies. It shall also act upon petitions by any two or more distri lying within the limits of the territory proposed be organized into a union. (Silber-Florida)
W74-05775

APPLICABILITY OF RULE OF STRICT OR A SOLUTE LIABILITY TO OVERFLOW ESCAPE OF WATER CAUSED BY D FAILURE,
W. R. Habeeb.
51 ALR3d 965 (1973).

Descriptors: *Judicial decisions, *Dam *Impoundments, *Dam failure, *Legal aspec Water law, Structures, Facilities, Streamflow, teration of streamflow, Water rights, Ripari rights, State governments, Jurisdicti Negligence, Water policy, Water control, Res voirs, Damages, Floods, Flow control, Di sions, Washouts, Water storage, Water supp Water distribution, Water demand, Water util tion, Water requirements, Water structures.

This annotation collects cases discussing whet a rule of strict or absolute liability may apply overflow or escape of water caused by a d failure. Generally, it may be said that the owne a dam is not an insurer with respect to the co tion of the dam and is not liable for dama caused by the overflow or escape of water if dam should fail except on a showing of negligen Strict liability is applied when mandated by a s statute and has also been applied where the ow of a dam built it in such a way that it automatic gave way during a flood and damaged neighbo property. Acts of God, if they are the sole ca may be an excuse to escape from absolute liabi The doctrine of strict or absolute liability un these conditions was established in 1868 by an g glish decision, which still stands as a landm holding in this field. Absent a statute requiring application of strict liability, most jurisdict require the showing of negligence or an omis of a duty by the owner of the dam. (Silber-Flor
W74-05776

REGULATIONS CONCERNING WA DISCHARGE REQUIREMENTS, NATIO POLLUTANT DISCHARGE ELIMINAT SYSTEM.
California State Water Resources Control Bo Sacramento.
For primary bibliographic entry see Field 5G.
W74-05777

AMERICAN WATERWAYS: FLORIDA POLLUTION LEGISLATION MAKES IT O FIRST HURDLE,
Oregon Univ., Eugene. School of Law.
For primary bibliographic entry see Field 5G.
W74-05778

NO FAULT LIABILITY FOR OIL POLLUTI DAMAGE,
For primary bibliographic entry see Field 5G.
W74-05779

HIGHLIGHTS OF THE FEDERAL WA POLLUTION CONTROL ACT OF 1972,
Morgan, Lewis and Bockius, Washington, D.C
For primary bibliographic entry see Field 5E.
W74-05780

INTERNATIONAL IMPACT REPORTS ON THE CONSERVATION OF THE OCEAN E VIRONMENT,
Syracuse Univ., N.Y. Coll. of Law.
For primary bibliographic entry see Field 5G.
W74-05781

CCESS TO PUBLIC MUNICIPAL BEACHES: HE FORMULATION OF A COMPREHENSIVE EGAL APPROACH,
S. Goldman.
ffolk University Law Review, Vol 7, p 936-972, mmer 1973. 185 ref, 5 chart.

escriptors: *Public rights, *Legal aspects, hores, *Beaches, *Cities, *Constitutional law, ecreation, Natural resources, Seashores, Coasts, nefits, Local government, Water policy, Water mand, Water access, Water resources, Water sources development, City planning, Judicial cisions, Planning.
entifiers: *Coastal waters.

he legal aspects of public access to municipal eaches are studied. In response to growing popuion and expanding industrialization, American ciety is presently facing increasing difficulty in oviding adequate shoreline recreational facilities meet the public need. In seeking to establish a blic right to beach access, this note reviews the blic trust doctrine and the doctrine of irrevocae dedication, both of which have been successlly used to protect user rights, however, the ope of each has been limited. The Constitution one provides the broad applicability and substanve content necessary to support a successful atck upon discriminatory beach access fees. It apars that the right of public access to shoreline ecreational resources is a fundamental right for e purposes of the equal protection clause and at, therefore, beach access fees should be exmined with extremely strict judicial scrutiny. ven under the traditional, less stringent equal otection standard, exclusionary policies pracced by shorefront municipalities fail to pass the onstitutional test. (Silber-Florida)
W74-05783

WHO GOVERNS LOCAL WATERS,
Miami Univ., Fla. Ocean Law Program.
D. Cowan.
University of Miami Sea Grant Institutional Program, Report No. C-1, Summer 1973. 20 p.

Descriptors: *Water control, *Water law, *Legal spects, *Water policy, *Jurisdiction, Federal jurisdiction, State jurisdiction, Water rights, Coasts, Shores, Navigable waters, Political aspects, International agreements, Continental shelf, Structures, Pollution control, Environmental aspects, Erosion, Restoration, Hydroelectric power, Facilities, Cooperation, Coordination, Conservation, Management, Development, Channelization, Filling, Dredging.

It is essential to first determine which waters are internal and which comprise the territorial water areas of coastal states, both of which can be distinguished from the high seas which no nation politically controls. Coastal state jurisidiction over territorial waters extends, by international agreement, to the end of the continental shelf. Based upon the 'Commerce Clause' of the United States Constitution, federal jurisdiction extends to the wide range of activities and conditions related to all local, inland and coastal navigable waters. Within the federal scope is included navigation, waterfront construction, environmental water protection, restoration of eroded beaches, flood control, hydroelectric power operations and wildlife and recreational preserves. This federal control does not preclude state and local jurisidiction however. The Coastal Management Act of 1972 emphasizes federal, state and local cooperation in conservation and management of coastal regions. State and local control emphasizes building and developing aspects, filling and dredging, channelization, and control of water bottoms. (Silber-Florida)
W74-05784

LAFAYETTE PUBLIC HEARING TESTIMONY.
Louisiana Advisory Commision on Coastal and Marine Resources, Baton Rouge.
For primary bibliographic entry see Field 2L.
W74-05785

LAKE CHARLES PUBLIC HEARING TESTIMONY.
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
For primary bibliographic entry see Field 2L.
W74-05786

BURKE V. COLLEY (QUIET TITLE ACTION INVOLVING ACCRETION).
495 S. W. 2d 699 (Mo. Ct. App. 1973).

Descriptors: *Accretion, *Legal aspects, *Surveys, *Missouri, Patents, Banks, Judicial decisions, Federal government.

Occupiers of land west of the Current River, a non-navigable stream, brought action against occupiers of land east of river to quiet title to certain land east of the river. Defendants claimed adverse possession and acquisition by accretion. The trial court rendered judgment for plaintiffs. The Missouri Court of Appeals reversed and remanded holding that a survey which failed to show that it commenced at a corner established by government was incompetent and inadmissible. The court applied the rule that when the United States surveyed its lands along the banks of the river and sold and conveyed such lands by subdivision, the government patent conveyed the title to all of the lands lying between the meander line and the middle thread of the river unless prior to the patent the government surveyed such lands as subdivisions or expressly reserved them when not surveyed. The court also found the defendants' evidence of adverse possession and accretion was wanted due to lack of proper survey. (Sears-Florida)
W74-05787

PASSAIC VALLEY COUNCIL V. HARTWOOD SYNDICATE, INC. (ACTION TO DETERMINE RIGHTS TO USE OF RESERVOIR).
348 N.Y.S. 2d 883 (Sup. Ct. 1973).

Descriptors: *New York, *Judicial decisions, *Water law, *Water rights, Prescriptive rights, Groundwater, Riparian rights, Relative rights, Competing uses, Reservoirs, Riparian lands, Water utilization, Regulated flow, Impounded waters, Water resources, Water management, Surface waters, Water supply, Recreation, Water storage, Reasonable use, Water allocation, Water demand, Easements.

This court action, under New York State law, was brought by the owner of a portion of a reservoir bed, under deed from a canal company. One of the defendants owned the remainder of the bed and claimed rights in the reservoir pursuant to the canal company's subsequent conveyance of the canal and appurtenances and the company's earlier grant of hunting, fishing and sailing rights. The Supreme Court for Sullivan County held that the company's deed, reserving the reservoir rights, created only an appurtenant easement, the rights in which expired when the canal was abandoned by the company, and that prescriptive rights were not thereby established. It also held that notwithstanding the decision above, the defendant's hunting, fishing and sailing rights were exclusive over the entire reservoir. However, the Court, in sustaining the defendant's exclusive rights to hunting, fishing and sailing over the entire reservoir, could not exclude the plaintiff's bathing and swimming rights in the area of the reservoir he owned. Nor were the defendants entitled to a determination that the owner of the remaining reservoir bed was not entitled to continue to overflow the defendant's lands. (Silber-Florida)
W74-05788

HAMILTON V. DIAMOND (PROCEEDING SEEKING TO HAVE PERMIT TO FILL HUDSON RIVER AT CERTAIN ADDRESS DECLARED ILLEGAL AND VOID).
349 N.Y.S. 2d 146 (Sup. Ct. 1973).

Descriptors: *Water resources development, *Landfills, *Planning, *Erosion control, *Land development, *Permits, New York, Legislation, Legal aspects, Land management, Water quality, Judicial decisions, Natural resources, Public health, Environmental effects, navigable rivers.

Petitioners sought to have a fill permit rescinded in the interest of environmental conservation. Owners of the property had obtained the permit in order to meet a local zoning ordinance and build a residence on the property. Public hearings were held and it was determined that the application was in the public interest and would not adversely affect the health, welfare, and safety of the State, nor its natural resources. The court found the determination neither arbitrary, illegal or an abuse of discretion. On the contrary, there was testimony to the effect that unkept, overgrown property would be developed, the littered shoreline cleared up and river water would be cleansed. Further, erosion would be reduced and the property's tax assessment would be quadrupled. The court also stated that there was no conflict between the rules and regulations of the Commissioner of Environmental Conservation and the provisions of the Constitution and the Environmental Conservation Law. (Sutton-Florida)
W74-05789

CUSTIS FISHING AND HUNTING CLUB V. JOHNSON (BOUNDARY DISPUTE AS TO TITLE TO BED OF A MILL POND).
200 S.E. 2d 542 (Va. 1973).

Descriptors: *Virginia, *Judicial decisions, *Legal aspects, *Riparian rights, *Boundaries(Property), Boundary disputes, Water law, Water rights, Adverse possession, Ponds, Spillways, Water levels.

The parties to this boundary dispute action were adjacent property owners. The Court held that the plaintiff could not establish a prima facie case for a presumed grant of the disputed portion of the pond by proving prior peaceful possession under color of title, since defendants were not mere trespassers, but owners of property adjoining the pond. The defendants thus had a colorable claim to riparian interests extending to the center of the pond. The plaintiff also did not establish adverse possession by employment of caretakers, the posting of no fishing signs, stocking the pond with fish, maintaining and repairing mill dam and spillway, and annually lowering and raising the water level, since such conduct was not inconsistent with the rights of defendants as riparian owners. In addition, the deed did not exclude riparian interests of owner by describing property line as extending along the line of mill pond, for in the absence of express exclusion by deed, an owner adjoining a freshwater pond acquires whatever interest in the pond which his grantor possessed. (Ritchie-Florida)
W74-05790

SCENIC RIVERS.
Va. Code Ann., secs. 10-167 thru 10-175 (1970).

Descriptors: *Virginia, *Water law, *Water policy, *Water utilization, *Conservation, Planning, Land use, Land development, Project planning, Fishlife, Wildlife, Recreation, Shores, Environment, Streams, Dams, Reservoirs, Water resources, Water resources development, Structures, Impoundments, Diversions, Channelization, Canals, Water control, Water quality, Water quality control, Legal aspects, Public rights.

The Scenic Rivers Act is established with the express legislative purpose to conserve rivers,

streams, runs and waterways and their shores and immediate environs. Preservation of certain rivers or sections of rivers for their scenic values is a beneficial purpose of water resource policy. The rivers of natural beauty and high quality should be included within the Act to assure their use and enjoyment for their scenic, recreational, geologic, fish and wildlife, historic, cultural or other values. In all planning for the use and development of water and related land resources including the construction of impoundments, diversions, roadways, crossings, channelization, locks, canals and other uses which change the character of a stream or waterway or destroy its scenic values, full consideration and evaluation of the river as a scenic resource shall be given before alternative plans for use and development are approved. (Silber-Florida)
W74-05791

DRAINAGE CODE--ENVIRONMENTAL VALUES.
Ill. Pub. Acts, ch. 78-495, sec. 1 (1955), to be codified as, Ill. Stat., ch. 42, sec. 4-15.1 (1955).

Descriptors: *Illinois, *Drainage, *Environmental effects, *Legal aspects, Legislation, Drainage effects, Drainage practices, Drainage programs, Erosion, Pollution, Habitats.

This amendment to the Illinois Drainage Code provides that in performing any of the duties and in exercising any of the powers provided in this Code, the commissioners shall use all practicable means and measures, including consideration of alternative methods of providing the necessary drainage, to protect such environment values as trees and fish and wildlife habitat, and to avoid erosion and pollution of the land, water or air. (Sears-Florida)
W74-05796

PENALTIES FOR WATER POLLUTION.
Ill. Ann. Stat., ch. 111 1/2, secs. 1042, 1043, 1044, 1046 (Smith-Hurd Supp. 1973), as amended, act 78-862, secs. 42, 43, 44, 46 (1973) Ill. Pub. Acts.

Descriptors: *Penalties(Legal), *Illinois, *Water pollution, *Environmental control, *Legislation, *Ecology, Law enforcement, Environmental effects, Administration, Abatement, Water quality control, Legal aspects, Pollution abatement, Sewage, Sewage treatment, Water pollution sources, Aquatic life, Waste disposal, Construction, Federal Water Pollution Control Act.

Illinois has enacted statutes providing penalties and fines for acts leading to water pollution. Each violation may result in a civil penalty of $10,000 and a further $1,000 fine for each day the violation continues, as well as payment to the State of a reasonable sum for death of aquatic life. Procedures are set forth by which the Attorney General can obtain injunctive relief against such persons who violate and continue to violate pollution statutes, specifically industrial users, and public sewage works. Authority is granted local law enforcement agencies to enforce the Act. All such violations are classified as misdemeanors. More severe criminal penalties are provided for persons who knowingly violate the provisions of this staute. Any public body created by State law and having jurisdiction over disposal of wastes which has been directed to abate any violation of this statute, shall acquire or construct such facilities necessary to comply with the directive. Any unit of local government operating sewage works may adopt regulations providing for cost-sharing by users of the sewage works, or payments by industrial users, if necessary in order to be eligible for federal grants under the Federal Water Pollution Control Act. (Sutton-Florida)
W74-05797

BIG CYPRESS CONSERVATION ACT.
Fla. Laws 1973, Ch 130, secs 1, 2 to be codified as, Fla. Stat. sec. 380.055.

Descriptors: *Florida, *State governments, *Federal government, *Legislation, Aquifers, Groundwater reservoirs, Groundwater recharge, Watershed management, Wildlife habitats, Water supply, Condemnation, Legal aspects, Federal reservations, Public lands, Parks, Regulation, Estuaries, Water management(Applied).
Identifiers: *Big Cypress Area.

The Big Cypress Area of Florida has a significant impact upon environmental and natural resources both in the state and regionally. The area is one of critical state concern as that term was employed in the Florida Environmental Land and Water Management Act of 1972. The area includes the Federal Big Cypress Fresh Water Reserve, along with contiguous land and water areas ecologically linked with Everglades National Park, the estuarine fisheries of south Florida, and the fresh water aquifer of south Florida. The precise boundaries of the area are to be determined by hearings. The statute also provides for the spending of forty million dollars for the acquisition of property in the area proposed as the Federal Big Cypress National Fresh Water Reserve. Any land acquired is to be donated and conveyed to the federal government, when Congress authorizes the acquisition of the Fresh Water Reserve. The Big Cypress Area is a water storage and recharge area, and is an integral part of the water management district of which the area is a part. The act authorizes the governor and the cabinet to exercise the power of eminent domain to acquire the necessary lands. (Sperling-Florida)
W74-05798

PUBLIC SERVICE COMPANIES--COOKING GAS AND WATER SERVICE.
Conn. Gen. Stat. Ann. secs. 19-65(Supp. 1972), as amended, Act 73-244, secs 19-65 (1973). Pub. Acts of Conn.

Descriptors: *Connecticut, *Statutes, *Public utilities, Water distribution(Applied), Water control, Water consumption, Legal aspects, Public rights, Administration, Public health, Social aspects, Legislation, Water, Water law, Water supply, Water rights, Water policy, Water utilization, Water allocation.
Identifiers: *Administrative regulations.

Connecticut requires that any building, or portion thereof occupied as a home, residence, office, or place of business, be furnished with hot water or water where the express or implied terms of the lease or rental agreement requires such a furnishing. Anyone failing to furnish such water is deemed to be interfering with the comfortable or quiet enjoyment of the premises and may be fined up to one hundred dollars or imprisoned not more than sixty days. No public service company, at the request of any lessor, shall cause the terminating of water service with respect to any leased property unless the lessor furnishes a statement signed by the lessee agreeing to the termination, or a notarized statement by the lessor that the premises are vacant. (Sperling-Florida)
W74-05799

JACK AND THE DRAGLINE,
For primary bibliographic entry see Field 2L.
W74-05804

PROPOSED CHATTOOGA NATIONAL WILD AND SCENIC RIVER, NORTH CAROLINA, SOUTH CAROLINA, AND GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05805

ENVIRONMENTAL QUALITY ANNUAL REPORT (3RD) OF THE COUNCIL ON ENVIRONMENTAL QUALITY.
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 6G.
W74-05807

ENVIRONMENTAL LAW--ZONING--ORDINANCE PROHIBITING FILLING OF WET LANDS ADJACENT TO NAVIGABLE WATERS WITHOUT PERMIT IS CONSTITUTIONAL EXERCISE OF POLICE POWER NOT REQUIRING COMPENSATION.
Harvard Law Review, Vol 86, p 1582-1592, 1973, 56 ref.

Descriptors: *Wisconsin, *Judicial decisions, *Legal aspects, *Water law, *Regulations, Land use, Land development, Wetlands, Land control, Ecology, Environment, Environmental effects, Public policy, Legislation, State governments, Filling, Water policy, Riparian rights, Streams, Rivers, Lakes, Ponds, Channels, Land management, Land reclamation, Conservation, Natural resources, Permits, Zoning.

This article deals with the decision in Just v. Marinette County, 56 Wis. 2d 7, 201 N.W.2d.76 (1972), holding that an ordinance prohibiting the filling of wetlands adjacent to navigable water without a permit is a constitutional exercise of the police powers and does not require payment of compensation. The Wisconsin legislature authorized countries to adopt zoning ordinances regulating the use of shorelands, defined as all lands within 1,000 feet of the normal highwater level of navigable lakes, ponds, and flowages, or within 300 feet of navigable rivers and streams. Subsequently the defendant, Marinette County, enacted this ordinance prohibiting the filling of more than 500 square feet of wetlands. The Wisconsin Supreme Court, reasoning that preservation of the wetlands is an important ecological requirement, held that to require that the owner be compensated for use restrictions imposed on wet lands makes preservation of such areas considerably less likely. It should be noted that other jurisdictions require compensation, keying on the notion that unless payment is made the ordinance is confiscatory. (Silber-Florida)
W74-05815

FEDERAL COMMON LAW IN INTERSTATE WATER POLLUTION DISPUTES,
For primary bibliographic entry see Field 5G.
W74-05816

ENVIRONMENTAL PROTECTION.
Conn. Gen. Stat. Ann. subsections 22a-1, 22a-5, 22a-6, 22a-7, 22a-12, 22a-28, 22a-29, 22a-30, 22a-32, 22a-36, 22a-38 to 22a-45 (Supp. 1973) as amended, act 73-571, subsections 1 to 6, act 73-590, section 1 (1973). Pub. Acts of Conn.

Descriptors: *Connecticut, *Environment, *Watershed management, *Erosion control, *Water resources, *Water supply, Water resources development, Legislation, Enforcement, Local governments, Permits, Inter-agency cooperation, Administration, Water rights, Water quality.

The very broad purpose of the statute is to conserve, improve, and protect Connecticut's natural resources and environment and to control air, land and water pollution in order to enhance the health, safety, and welfare of the people. The Commissioner of the department of environmental protection shall carry out the environmental policies of the state and shall have all powers necessary and convenient to discharge his listed duties. The Commission shall also adopt or amend environmental standards, criteria, and regulations, shall deal with complaints and conduct investigations

and hearing pursuant to said standard. A council on environmental quality has been created and shall submit annual reports concerning their activities. The act declares a state policy of preserving tidal wetlands which are being slowly destroyed. The Commissioner is given the right to inspect such tidal wetland areas at reasonable times and the regulated activities are dealt with concerning applications, permits and hearings if needed. Sections 22a-36 to 22a-45 inclusive are cited as the Inland Wetlands and Watercourses Acts and means to protect these indespensible, irreplaceable natural resources are provided and the statute lists various operations and uses permitted in the wetlands. Municipal participation is encouraged. (Sutton-Florida)
W74-05818

POTENTIAL DANGER FROM THE INDIAN CATFISH, HETEROPNEUSTES FOSSILIS (BLOCH),
California State Polytechnic Coll., Pomona. Dept. of Biological Sciences.
For primary bibliographic entry see Field 8I.
W74-05829

WATER SUPPLY PROBLEMS AND FUTURE RESOURCES,
Water Resources Board, London (England). Research Div.
For primary bibliographic entry see Field 6D.
W74-05864

WATER CONVEYANCE: LAWS, ORGANIZATION AND EFFICIENCY,
Colorado State Univ., Fort Collins. Dept. of Economics.
G. E. Radosevich.
Paper presented at the American Society of Civil Engineers National Water Resources Engineering Meeting, Jan. 29-Feb. 2, 1973, Washington, D.C. Meeting Preprint 1906, 21 p, 2 fig, 20 ref. OWRR B-083-COLO(4).

Descriptors: *Water law, *Water rights, Organizations, *Water conveyance, *Prior appropriation, *Institutional constraints, Legal aspects, Efficiencies, Water allocation.
Identifiers: *Legal constraints, *Western U.S.

Water in the western U.S. is allocated and distributed according to the prior appropriation doctrine. This doctrine was developed during the mid-1800's as a solution to conflicts arising between those competing for available stream flows. Few changes have occurred in the substantive or procedural aspects of this law, resulting in a lag between water management technology and the law's capability to incite implementation of these developments. The principal legal concept in the appropriation doctrine which has served as the constraint to effective adoption of more efficient practices within the water conveyance and use systems is the property right in water. The water right is at the heart of the doctrine. To resolve the water management problem in the West, recommendations are suggested for changing or reinterpreting the doctrine governing the exercise of this right. Four basic alternatives exist: do nothing; provide incentives within the legal framework; modify organizational capabilities; or enforce the law strictly. The recommendations will lead to implementation of more efficient water management technology in an attempt to solve the quantity and quality problems existing at the state, interstate, and international levels.
W74-05910

INDIAN WATER RIGHTS: LEGAL VARIABLES IN REGIONAL WATER MANAGEMENT,
California Univ., Los Angeles. School of Law.
G. D. Weatherford.
American Association for the Advancement of Science, 140th Paper presented at meeting, San Francisco, February 1974. 13 p.

Descriptors: *Water law, Indian reservations, Water policy, Water resources development, *Water rights, Pueblo water rights, Appropriation, Equitable apportionment, Legal aspects, Competing uses, Irrigated land, *Reservation Doctrine, Water utilization, Water management(Applied), Non-structural alternatives, Water distribution(Applied), Water allocation(Policy), *Colorado River Basin, Regional analysis.
Identifiers: *Indian Water Rights, *Navajo Indians.

The right of the American Indian to use water has been assumed to be protected by his reserved water rights, defined as furnishing the amount of water necessary to fulfill the purposes for which the affected reservation was created. The validity of this assumption is examined here by using the amount of irrigable land on the reservation as a yardstick. Even if not used currently, it is assumed to be set aside for future use. The actual judicial constraints of reserved water rights, however, are open to argument, with rights functioning as a license to wait, to bargain, or to litigate. When supply greatly exceeds demand, development of Indian water usage may safely be deferred in favor of non-Indian development, in effect being a license to wait, in the sense that Indian use of his apportionment will be exercised as his need arises. When supply is at a level where the Indian water right claim clouds the financial feasibility of a proposed non-Indian project, the Indian tribe can waive its water claim, or a portion of it, for a price, in effect a license to bargain. When such bargaining promises to be less beneficial than the application of the reserved water right, the tribe may litigate for the quantity of water involved, in effect a license to litigate. These three interpretations are discussed within the framework of the Colorado River Basin and the Navajo Indian tribe particularly. (Muller-Arizona)
W74-05922

SCIENTIFIC INFORMATION IN THE DECISION TO DAM GLEN CANYON,
California Univ., Davis. Dept. of Geology.
For primary bibliographic entry see Field 6G.
W74-05925

6F. Nonstructural Alternatives

GUIDELINES FOR DEALING WITH FLOODS ON HAY CREEK.
Army Engineer District, Philadepa.
For primary bibliographic entry see Field 4A.
W74-05532

EFFECTS OF URBANIZATION ON STREAM CHANNELS AND STREAM FLOW,
Regional Science Research Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 4C.
W74-05534

FLOOD PLAIN MANAGEMENT.
For primary bibliographic entry see Field 6E.
W74-05755

FLOOD HAZARD ANALYSES, SAND CREEK, CITY OF COLORADO SPRINGS, AND EL PASO COUNTY.
Soil Conservation Service, Portland, Oreg.
For primary bibliographic entry see Field 2E.
W74-05860

FLOOD PLAIN INFORMATION-BACK CREEK IN ROANOKE COUNTY, VIRGINIA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-05866

FLOOD PLAIN INFORMATION: NEUSE RIVER-ADKIN BRANCH, CITY OF KINSTON, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-05867

INDIAN WATER RIGHTS: LEGAL VARIABLES IN REGIONAL WATER MANAGEMENT,
California Univ., Los Angeles. School of Law.
For primary bibliographic entry see Field 6E.
W74-05922

6G. Ecologic Impact Of Water Development

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF R. E. GINNA NUCLEAR POWER PLANT UNIT I, ROCHESTER GAS AND ELECTRIC CORPORATION.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-05422

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED CATAWBA NUCLEAR STATION, UNITS 1 AND 2, DUKE POWER COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-05423

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF SAN ONOFRE NUCLEAR GENERATING STATION UNIT 1, SOUTHERN CALIFORNAI EDISON COMPANY AND THE SAN DIEGO GAS AND ELECTRIC COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-05424

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED LIMERICK GENERATING STATION, UNITS 1 AND 2, PHILADELPHIA ELECTRIC COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-05425

FINAL ENVIRONMENTAL STATEMENT RELATED TO OPERATION OF DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3, COMMONWEALTH EDISON COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-05426

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE HADDAM NECK (CONNECTICUT YANKEE) NUCLEAR POWER PLANT, CONNECTICUT YANKEE ATOMIC POWER COMPANY.
Directorate of Licensing (AEC), Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-05427

FINAL ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION OF GRAND GULF NUCLEAR STATION UNITS 1 AND 2, MISSISSIPPI POWER AND LIGHT COMPANY.
Directorate of Licensing (AEC), Washington, D.C.

For primary bibliographic entry see Field 5C.
W74-05428

NEPA IN THE COURTS: A LEGAL ANALYSIS OF THE NATIONAL ENVIRONMENTAL POLICY ACT,
Environmental Law Inst., Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-05586

LIFE OF THE LAND V. BRINEGAR (ACTION TO ENJOIN SEAWARD RUNWAY FOR AIRPORT).
For primary bibliographic entry see Field 6E.
W74-05593

ENVIRONMENTAL IMPACT AND WATER DEVELOPMENT,
California Univ., Davis. Div. of Environmental Studies.
C. R. Goldman.
Journal American Water Works Assoc, Vol 64, No 9, p 545-549, September 1972. 4 fig, 10 ref.

Descriptors: *Water resources development, *Planning, *Social participation, Conservation, Methodology, Social values, Cost-benefit analysis, Decision making, Environmental effects, Preservation, Water quality, National Water Commission.
Identifiers: *Environmental quality, Public opinion, California Water Plan, Wisconsin Shoreland Protection Law, Skippack Watershed Project(Penn).

Changing attitudes on water development and environmental quality are surveyed. The last decade has seen the evolution of widespread public concern over environmental deterioration, bringing on a confrontation with development interests. The causes of this are briefly considered and recommendations to deal with this problem are evaluated. In order to incorporate contemporary attitudes into water development projects, environmental as well as developmental interests must be brought into all aspects of resource planning. Incorporation of public values and attitudes into the decision making process is vital to successful planning. To overcome citizen frustration, cynicism, and disillusionment resulting from lack of real public involvement, and the inadequate staffing of resource agencies, it is recommended that the planning of water projects be completely separated from the construction and regulatory agencies. Also, physical, biological, and social scientists should be part of the planning team together with the traditional engineering and economic input. Methodologies should include the incorporation of environmental quality factors into cost benefit analysis with emphasis on the maximization of social benefits. Simulation models, impact analysis, land use zoning, and resource inventories are new techniques which are beginning to be applied in this area. Examples of both positive and negative planning are cited. (Slattery-Wisconsin)
W74-05619

BIOLOGICAL MANAGEMENT AND CONSERVATION: ECOLOGICAL THEORY, APPLICATION AND PLANNING,
M. B. Usher.
Chapman and Hall: London, England; (Dist in USA by Halsted Press, a division of John Wiley and Sons, Ins: New York, N Y). 1973. 394 p. Illus. Maps. Pr $22.00.
Identifiers: Biological studies, *Conservation, Distribution, *Ecological theory, *Ecosystems, *Management, *Planning, *Scotland(Aberlady Bay region), Statistics, Publications.

Discussions are presented on various aspects involving biological management and conservation. An introductory section discusses the development of man, population and technology, the processes of change and legislative action. The remaining portion of the book is divided into 3 major sections. Part 1, ecological theory, discusses the distribution of organisms in space, the distribution of organisms in time, the concept of the ecosystem, classification of ecosystems and the response of ecosystems to exploitation. Part 2, application, discusses conservation and biological management, conservation and preservation, conservation and education and conservation and recreation. Part 3, planning, discusses the management plan and describes the Aberlady Bay Local Nature Reserve (Scotland) management plant. Two appendixes are also included containing the following information: matrix operations, including definition and names, addition and subtraction, multiplication, inversion and latent roots and vectors; and some commonly used statistics. An extensive list of references is included.--Copyright 1973, Biological Abstracts, Inc.
W74-05622

PARKLAND PLANNING AND LAKE MANAGEMENT IN THE ROCK RIVER BASIN.
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 6B.
W74-05624

WATER MANAGEMENT AND THE ENVIRONMENT.
Organization for Economic Co-Operation and Development, Paris (France). Water Management Section Group.
Report 89771, 1973. 64 p, 1 fig, 42 ref.

Descriptors: *Administration, *Environmental effects, *Decision making, *Social participation, Social aspects, Social impact, Alternative planning, Flood control, Water resources development, Weather modification, Desalination, Inter-basin transfers, Nuclear powerplants, Long-term planning, Intangible costs, Measurement, Institutional constraints, Evaluation.
Identifiers: *Environmental impact, Matrix methods.

A report of the Water Management Sector Group of the OECD considers the environmental impact of water management decisions. A brief historic overview of growing environmental impacts and concomitant concern in the world is given. They may be partially explained by growth and change in technology, in world needs and demand, and in the advanced educational level of the public. Environmental impact and public involvement are discussed. Greater understanding of the former has been hindered by imperfect knowledge of the ecosystem, inabilities to quantify impacts, or to reconcile long-run and short-run effects. Suggestions are made to rectify these problems by development of requisite impact data, of models predicting man's impact on the ecosystem, and of gaining assurances that such data would become an integral part of the decision process. To accomplish these tasks, the use of matrix methods which plot environmental impacts, independent review boards, and adversative procedures are discussed. Improved public awareness and involvement to assure that the public interest is served and to avoid adverse reactions at a late stage of project development are emphasized. Recent trends including increasing use of alternative plans, studies of the choice process, and selected institutional changes and their impact on management decisions are described. (Schroeder-Wisconsin)
W74-05625

APPLICATION OF MICROECONOMIC MODELS TO REGIONAL ENVIRONMENTAL QUALITY MANAGEMENT,
Resources for the Future, Inc., Washington, D. C.
For primary bibliographic entry see Field 6A.
W74-05627

ECONOMIC GROWTH VS. ENVIRONMENTAL PROTECTION: WHAT WILL BE THE OUTCOME,
Wisconsin Univ., Madison. Dept. of Economics and Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W74-05644

ENERGY PRODUCTION AND ENVIRONMENTAL CONSEQUENCES,
Office of Science and Technology, Washington D.C.
For primary bibliographic entry see Field 5C.
W74-05645

ECONOMICS OF AQUACULTURE DEVELOPMENT,
Hawaii Univ., Honolulu. Sea Grant Program.
For primary bibliographic entry see Field 6C.
W74-05646

LEGAL-ECONOMIC ASPECTS OF FISHERIES SESSION SUMMARY,
Louisiana State Univ., Baton Rouge. Law School
For primary bibliographic entry see Field 6E.
W74-05649

FISHERY PROBLEMS AND THE U.S. DRAFT ARTICLE,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-05650

WILL SUCCESS SPOIL NEPA,
For primary bibliographic entry see Field 6E.
W74-05750

WILDERNESS PRESERVATION II: BRINGING THE CONVENTION INTO COURT,
Environmental Law Inst., Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-05766

BIG CYPRESS CONSERVATION ACT.
For primary bibliographic entry see Field 6E.
W74-05798

CAN WE SAVE OUR SALT MARSHES,
Connecticut Agricultural Experiment Station New Haven.
For primary bibliographic entry see Field 2L.
W74-05803

PROPOSED CHATTOOGA NATIONAL WILD AND SCENIC RIVER, NORTH CAROLINA SOUTH CAROLINA, AND GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-05805

LITTLE RUNNING WATER DITCH WATERSHED PROTECTION, FLOOD PREVENTION, AND LAND DRAINAGE R(AND D MEASURE PLAN (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4D.
W74-05806

ENVIRONMENTAL QUALITY ANNUAL REPORT (3RD) OF THE COUNCIL ON ENVIRONMENTAL QUALITY.
Council on Environmental Quality, Washington D.C.

Available from Sup Doc, GPO, Washington, DC, $2.00, and the National Technical Information Service as PB-211 960, $1.45 in microfiche. August 1972. 475 p, 66 tab, 4 map, 12 chart, 5 illus, 2 dwg, 13 photo, 3 append.

Descriptors: Environmental effects, *Governments, *Legislation, *Judicial decisions, *Water pollution, Human population, Distribution patterns, Water demand, Social aspects, Industrial wastes, Oil spills, Treatment facilities, Administration, Regulation, Foreign governments, Oceans, Marine biology.
Identifiers: *Environmental quality, Standing(Legal), *National Environmental Policy Act, Ocean dumping.

The status of and the trends in environmental quality are emphasized, and the interrelationships are examined of population, technology, pollution, and other factors that will shape the future environment. The year's (1971-1972) major developments at the international, federal, state and local levels are discussed. The impact of pollution control costs on fourteen industries as well as on the overall economy is described. A comprehensive analysis of the National Environmental Policy Act (NEPA) and a discussion of national parks are included. Specific coverage includes developments in the area of ocean pollution caused by the atmosphere, rivers, ships, and ocean dumping. There has been expansion at all governmental levels via legislation and regulations affecting water quality, marine sanitation, oil and hazardous substance spills as well as grants for waste treatment facilities. Recent results of judicial decisions including citizen's standing, agency action and industry plaintiffs are discussed. (Conko-Florida)
W74-05807

GATHRIGHT LAKE, JACKSON RIVER, JAMES RIVER BASIN, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W74-05808

BIRCH LAKE, BIRCH CREEK, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W74-05809

NEW MELONES LAKE, STANISLAUS RIVER, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W74-05810

UNDERGROUND NUCLEAR TESTING PROGRAM, NEVADA TEST SITE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Division of Environmental Affairs (AEC), Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-05811

HAVASU INTAKE CHANNEL, HAVASU PUMPING PLANT AND BUCKSKIN MOUNTAINS TUNNEL, ARIZONA-NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boulder City, Nev. Region 3.
For primary bibliographic entry see Field 8C.
W74-05812

BEACH EROSION CONTROL PROJECT, DELRAY BEACH, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 8A.
W74-05813

CONSTRUCTION OF WASTEWATER FACILITIES, LUFKIN, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Federal Highway Administration, Austin, Tex.
For primary bibliographic entry see Field 5D.
W74-05814

WATER SUPPLY PROBLEMS AND FUTURE RESOURCES,
Water Resources Board, London (England). Research Div.
For primary bibliographic entry see Field 6D.
W74-05864

LAKE NORMAN DEVELOPMENTAL IMPACT STUDY,
North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.
For primary bibliographic entry see Field 6B.
W74-05869

ENVIRONMENTAL QUALITY PLANNING - GOALS, POLICIES, AND OBJECTIVES.
East-West Gateway Coordinating Council, St. Louis, Mo.
For primary bibliographic entry see Field 6B.
W74-05876

SCIENTIFIC INFORMATION IN THE DECISION TO DAM GLEN CANYON,
California Univ., Davis. Dept. of Geology.
P. C. Perkins.
American Association for the Advancement of Science, 140th Paper presented at meeting, San Francisco, Feb. 1974. 32 p, 32 ref.

Descriptors: Colorado River, *Damsites, Dams, *Reservoirs, *Engineering structures, *Colorado River Basin, Rivers, *Arizona, Water resources, Water resources development, River systems, Geology, Hydraulic structures, Hoover Dam, Dam construction, Engineering geology, River regulation, Multiple-purpose reservoirs.
Identifiers: *Glen Canyon Dam.

In anticipation of legislative debates over authorization of the construction of a dam to block Glen Canyon, the environmental impacts of the creation of Lake Powell are examined in the light of subprojects of the current Lake Powell Research Project. They were considered also in the 1950's during the debate of the Colorado River Storage Project and even as far back as the 1920's at the time when Glen Canyon was discussed as a possible site for what became Boulder Dam and Lake Mead. The engineering and physical science considerations in the evaluation of the proposed dam are presented. A site evaluation, evaporation estimate, sedimentation analysis and bank storage estimate are included as are comparative developments along the Colorado River. (Muller-Arizona)
W74-05925

7. RESOURCES DATA

7B. Data Acquition

INVESTIGATIONS OF FRESHWATER SURFACE MICROLAYERS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W74-05410

SEMIAUTOMATED METHOD FOR MORE PRECISE AND SENSITIVE DETERMINATION OF NONPOLAR ANTICHOLINESTERASE INSECTICIDES WITH TECHNICON MODULES,
Ciba-Geigy Ltd., Basel (Switzerland). Agrochemical Div.
For primary bibliographic entry see Field 5A.
W74-05496

AN IMPROVED ION-EXCHANGE TECHNIQUE FOR THE CONCENTRATION OF MANGANESE FROM SEA WATER,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5A.
W74-05506

APPLICATIONS OF AERIAL PHOTOGRAPHY AND ERTS DATA TO AGRICULTURAL, FOREST AND WATER RESOURCES MANAGEMENT.
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
Available from NTIS, Springfield, Va 22151 as N73-31357 for $3.00 printed copy; $1.45 microfiche. Research Report 73-1, July 1973. 86 p. NASA Grant NGL 24-005-263.

Descriptors: *Remote sensing, *Infrared radiation, *Plant pathology, Diseases, Plant diseases, Fungi, *Mapping, *Aerial photography, *Data collections.

Remote sensing techniques were studied for use in detecting forest disease, determining water quality in peat, classifying forests, detecting saline soils, and surveying insect damage in corn and alfalfa. Infrared aerial photography used with density slicing techniques was the most successful of the methods studied for detecting crop damage. For crop identification and water-quality monitoring, small-scale infrared aerial photography can be very economical. (See W74-05516 thru W74-05521) (Knapp-USGS)
W74-05515

FOREST DISEASE DETECTION AND CONTROL,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
D. W. French, R. W. Douglass, and M. P. Meyer.
In: Applications of Aerial Photography and ERTS Data to Agricultural, Forest and Water Resources Management. Institute of Agriculture Remote Sensing Laboratory Research Report 73-1, Chapter 1, p 1-22, July 1973. 7 fig, 3 ref. NASA Grant NGL 24-005-263.

Descriptors: *Remote sensing, *Infrared radiation, Plant pathology, Diseases, *Plant diseases, Fungi, Mapping, *Aerial photography, Rots, Minnesota.
Identifiers: *Mistletoe infection, *Plant rot.

Dwarf mistletoe infections as small as 0.1 acre were visible on infrared color film at scales as small as 1:118,000. Detection of 0.1 acre centers was easy at scales of 1:31,680. Individual aspen trees killed by the hypoxylon fungus were detected with relative ease at scales of 1:6,000. Armillaria root rot in red pine was detectable only after the trees had died and the foliage had turned from green to brown. (See also W74-05515) (Knapp-USGS)
W74-05516

EVALUATION OF PEATLAND WATER TABLE ELEVATION AND WATER QUALITY INDICATORS,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
A. C. Mace, Jr.
In: Applications of Aerial Photography and ERTS Data to Agricultural Forest and Water Resources Management. Institute of Agriculture Remote Sensing Laboratory Research Report 73-1, Chapter 2, p 23-34, July 1973. 5 fig, 1 tab. NASA Grant NGL 24-005-263.

Descriptors: *Remote sensing, *Peat, *Water table, *Water quality, *Aerial photography, Infrared radiation, Mapping, Swamps, Wetlands, Sampling, Algae, *Minnesota.
Identifiers: *Chippewa National Forest(Minn).

Remote sensing techniques were evaluated for monitoring water table elevation of peatland areas for flood prediction and water quality changes. Density values of color infrared photography were significantly correlated with water table elevation. Correlation of film density with water table depth was not significant due to the undulating surfaces of peatlands. Identification of aquatic vegetation and population by image enhancement and density level slicing was not successful although sufficiently encouraging to modify sampling techniques. Large scale photography (1:3,000-6,000), precise location of sampling points, and time of sampling are modifications which should improve results. (See also W74-05515) (Knapp-USGS)
W74-05517

FOREST VEGETATION CLASSIFICATION AND MANAGEMENT,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
R. W. Douglass, and M. P. Meyer.
In: Applications of Aerial Photography and ERTS Data to Agricultural, Forest and Water Resources Management. Institute of Agriculture Remote Sensing Laboratory Research Report 73-1, Chapter 3, p 35-52, July 1973. 5 fig, 7 tab, 4 ref. NASA Grant NGL 24-005-263.

Descriptors: *Remote sensing, *Aerial photography, *Forestry, Infrared radiation, Forest management, Mapping, *Classification, Surveys, Land management, *Minnesota.
Identifiers: *Chippewa National Forest(Minn).

Foresters were able to classify vegetation species to an 85% level of accuracy on 1:120,000 color infrared fall photography. Accuracy was less with ordinary color photography and summer season photography (color and infrared color). Small-scale aerial photography for first stage (and, in some cases, second stage) multistage forest vegetation classification and sampling was very useful. Significant savings in aerial photo procurement and interpretation costs are possible for certain uses of very small-scale aerial photography in lieu of conventional (larger) scales of forest photography. (See also W74-05515) (Knapp-USGS)
W74-05518

DETECTING SALINE SOILS IN THE RED RIVER VALLEY, MINNESOTA, BY REMOTE SENSING TECHNIQUES,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
R. H. Rust, and B. H. Gerbig.
In: Applications of Aerial Photography and ERTS Data to Agricultural, Forest and Water Resources Management. Institute of Agriculture Remote Sensing Laboratory Research Report 73-1, Chapter 4, p 53-68, July 1973. 6 fig, 3 tab, 11 ref. NASA Grant NGL 24-005-263.

Descriptors: *Saline soils, *Remote sensing, *Infrared radiation, *Aerial photography, *Minnesota, Soil surveys, Mapping.
Identifiers: *Red River Valley(Minn).

Photo imagery was evaluated for detection and delineation of saline-affected soil areas in the Red River Valley of Minnesota. Two 10-mile transects crossing the common range of soil conditions were studies. Ground truth consisted of mapping the soils in the saline-affected area at a 1:20,000 scale and making conductivity measurements in grain and fallow fields in saline and nonsaline areas. Kodachrome 35 mm imagery was used to broadly outline affected areas. Density slicing techniques were employed on color infrared imagery in a qualitative analysis. After separation of cultural patterns, identification of saline-affected areas was greatly facilitated by image analysis. (See also W74-05515) (Knapp-USGS)
W74-05519

CORN DEFOLIATION SURVEYS,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
H. C. Chiang, and M. P. Meyer.
In: Applications of Aerial Photography and ERTS Data to Agricultural, Forest and Water Resources Management. Institute of Agriculture Remote Sensing Laboratory Research Report 73-1, Chapter 5, p 69-75, July 1973. 2 fig, 10 ref. NASA Grant NGL 24-005-263.

Descriptors: *Remote sensing, *Infrared radiation, *Plant diseases, Defoliants, Crops, *Corn(Field), *Minnesota.
Identifiers: *Defoliation, *Insect damage.

Remote sensing was studied for use in detecting crop-insect infestation by aerial photography of artificial defoliation in corn. Defoliation of plant tops was easily detected, while that on the base was less so. Aero infrared film with a Wratten 89B filter gave the best results. Morning flights at a scale of 1:15,840 are recommended. Row direction, plant growth stage, and time since defoliation were not important. Image enhancement significantly improved the threshold of defoliation recognition, but added a cost factor which may not be acceptable in terms of commercial remote sensing survey techniques. (See also W74-05515) (Knapp-USGS)
W74-05520

ALFALFA CROP PRODUCTIVITY ANALYSIS,
Minnesota Univ., St. Paul. Inst. of Agriculture Remote Sensing Lab.
D. K. Barnes, and M. P. Meyer.
In: Applications of Aerial Photography and ERTS Data to Agricultural Forest and Water Resources Management, Institute of Agriculture Remote Sensing Laboratory Research Report 73-1, Chapter 6, p 76-82, July 1973. 5 fig, 3 ref. NASA Grant NGL 24-005-263.

Descriptors: *Remote sensing, *Crops, *Alfalfa, Crop production, *Plant diseases, *Aerial photography, *Minnesota.

Sequential, ERTS-compatible multispectral, multiscale 70 mm aerial photography on a study area containing five varieties of alfalfa was studied to determine whether aerial remote sensing techniques could differentiate insect and disease injury. Visual analysis of 1:6,000 to 1:15,000 scale color infrared aerial photography could distinguish relative pest injury. An improvement in pest injury detection was found with image enhancement (density slicing) of the color infrared. There may be a correlation between film density readings and crop yields. (See also W7
W74-05521

MANUAL FOR ESTIMATION OF PROBABLE MAXIMUM PRECIPITATION.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 2B.
W74-05524

THE DETECTION OF SUBSURFACE STREAM CHANNELS IN CARBONATE ROCKS BY GEOELECTRICAL METHODS,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2F.
W74-05541

THE NATURAL MEDIUM AND SPACE,
K. Y. Kondrat'yev.
Available from NTIS, Springfield, Va 22151 AI 768 459 Price $3.00 printed copy; $1.45 microfich Air Force Systems Command, Foreign Technol gy Division Translation 24-704-73, 1973. 17 p, tab.

Descriptors: *Remote sensing, *Review *Satellites(Artificial), Photography, Infrare radiation, Radar, Microwaves.
Identifiers: USSR.

Remote sensing from satellites includes televisio photography, heat observation in the infrared, ar microwave radiometry. Photography in the visib range of the spectrum gives normal photograp and the television images which, presenting lar sections of surface, are extremely informative f analysis of the distribution of cloud cover, veget tion, and geologic structures. Photography in th infrared region of the spectrum shows a picture cloud distribution on the night side of the plan and makes it possible to judge the thermal state the earth's surface. Microwave sensing makes possible to determine the moisture and water co tent in the thickness of atmosphere, to dete icebergs, to estimate icy state and the surface co ditions of the oceans. Radar is used to study th hydrographic network: to detect river systems, determine the area of catchment, the perimeter basin, the extent of tributaries, the slope of th slopes of valleys. In geologic studies, radar revea the geologic structure and composition of bedroc (Knapp-USGS)
W74-05544

METHODS OF MEASURING SOIL MOISTURE
McMaster Univ., Hamilton (Ontario).
For primary bibliographic entry see Field 2G.
W74-05557

MICROWAVE RADIATION CHARA TERISTICS OF DRY AND MOIST GROUN COVERS,
For primary bibliographic entry see Field 2C.
W74-05558

BIG EYE IN THE SKY,
P. Briggs.
National Wildlife, Vol 9, p 35-38, February-Marc 1971. 4 photo.

Descriptors: *Aerial sensing, *Aerial photo raphy, *Aircraft, *Satellites(Artificial), Camera Electronic equipment, Mapping, Spe trophotometry, Maps, Exploration, Exploitatio Terrain analysis, Colorimetry, Water pollutic sources, Federal government, Depos tion(Sediments), Flood control.

New sensing devices and high flying satellit present great promise in the fight to sa resources. Hidden sources of pollution can be d tected and new fresh water sources can b discovered. The key to this involves remo sensing. The most advanced cameras now used aircraft research work have color sensitive lense Different plants, trees, etc. show up as differe color signatures. Satellites are much cheaper t use than aircraft as they are not dependent c good flying weather and do not need a pilot. Aer photographs enable one to map sediment depos tion easily because the entire sediment plume ca be seen at one time. Future satellite surveillanc can reveal thermal pollution, tankers dischargi oil waste, as well as floating algae and foam. Su veys of snow cover and melting patterns will mak flood predictions more accurate. Changing wat temperatures can also be detected as the temper ture of the sea has marked effects on the weathe (Sperling-Florida)
W74-05581

TENSIOMETER-PRESSURE TRANSDUCER SYSTEM FOR STUDYING UNSTEADY FLOW THROUGH SOILS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-05668

ESTIMATE OF THE ACCURACY OF DETERMINATION OF SNOW COVER CHARACTERISTICS AND RECOMMENDATIONS ON THE RATIONALIZATION OF THE SNOW MEASUREMENT NETWORK,
Main Geophysical Observatory, Leningrad (USSR).
For primary bibliographic entry see Field 2C.
W74-05844

AIRBORNE MEASUREMENT OF SNOW-WATER EQUIVALENT USING NATURAL GAMMA RADIATION OVER SOUTHERN ONTARIO, 1972-1973,
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 2C.
W74-05853

HANDBOOK FOR MONITORING INDUSTRIAL WASTEWATER.
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
For primary bibliographic entry see Field 5A.
W74-05862

OXYGEN ANALYZER,
Lowrance Electronics, Inc., Tulsa, Okla. (Assignee).
For primary bibliographic entry see Field 5A.
W74-05909

GAMMA RADIATION FOR MEASURING WATER CONTENTS IN SOIL COLUMNS WITH CHANGING BULK DENSITY,
Royal Veterinary and Agricultural Coll., Copenhagen (Denmark). Hydrotechnical Lab.
For primary bibliographic entry see Field 2G.
W74-05930

7C. Evaluation, Processing and Publication

GROUND-WATER DATA FOR HARRIS COUNTY, TEXAS: VOLUME II--RECORDS OF WELLS, 1892-1972,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-05527

GROUND-WATER DATA FOR HARRIS COUNTY, TEXAS: VOLUME III--CHEMICAL ANALYSES OF WATER FROM WELLS, 1922-71,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-05528

EXTENDED PERIOD SIMULATION OF WATER DISTRIBUTION NETWORKS,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4A.
W74-05533

AN EMPIRICAL MATHEMATICAL MODEL OF AN INTERCONNECTED WATERSHED SYSTEM,
Pennsylvania State Univ., University Park. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 2A.
W74-05543

THE NATURAL MEDIUM AND SPACE,
For primary bibliographic entry see Field 7B.
W74-05544

BASE OF FRESH GROUND WATER--APPROXIMATELY 3,000 MICROMHOS--IN THE SACRAMENTO VALLEY AND SACREMENTO-SAN JOAQUIN DELTA, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
C. F. Berkstresser, Jr.
Water Resources Investigation 40-73, 1973. 1 sheet, 1 map, 40 ref.

Descriptors: *Groundwater, *Saline water-freshwater interfaces, *California, Salinity, Water quality, Valleys, Deltas, Aquifers, Hydrogeology, Hydrologic data.
Identifiers: San Joaquin Delta, Sacramento Valley.

The base of fresh groundwater is delineated in the Sacramento Valley and the Sacramento-San Joaquin Delta, California. Changes in the altitude of the base of freshwater due to water-resources development can be monitored, and the freshwater zone can be considered in selecting sites for deep-well injection of liquid wastes. Also, altitudes of the base of freshwater can be used for groundwater model studies. About 4,000 chemical analyses were examined and 1,500 were used to corroborate information provided by 900 electrical logs. Fresh groundwater in the study area is contained almost exclusively in unconsolidated or poorly consolidated continental and volcanic deposits of Pliocene to Holocene age. The deposits have a maximum thickness of about 3,600 feet, but generally are much thinner. The surface of the base of freshwater is uneven and generally reflects the configuration of continental and volcanic deposits. Deeper geologic structures such as faults and gas reservoirs are rarely reflected in the shape of the base. Along the east margin of the valley, the basement complex of Mesozoic age delineates the lower limit of freshwater. Along the west margin, marine bedrock of Eocene age or older probably delineates the lower limit. In several parts of the valley, saline water zones are found near land surface. (Knapp-USGS)
W74-05553

THE WATER TABLE ON LONG ISLAND, NEW YORK, IN MARCH 1970,
Geological Survey, Mineola, N. Y.
For primary bibliographic entry see Field 4B.
W74-05556

WATER REQUIREMENTS OF ROSTERED IRRIGATION SCHEMES,
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.
For primary bibliographic entry see Field 3F.
W74-05667

DEVELOPING SIMULATION MODELS,
McMaster Univ., Hamilton (Ontario). Dept. of Civil Engineering and Engineering Mechanics.
For primary bibliographic entry see Field 2A.
W74-05672

WATER TABLE AND SOIL MOISTURE PROBABILITIES WITH TILE DRAINAGE,
Clemson Univ., S.C. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-05677

PROPOSAL FOR A PARTICLE-SIZE GRADE SCALE BASED ON 10,
Wisconsin Univ., Kenosha. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W74-05719

CLIMATIC DESCRIPTION OF DEW IN THE EUROPEAN USSR,
Main Geophysical Observatory, Leningrad (USSR).
For primary bibliographic entry see Field 2B.
W74-05839

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR DEEP CREEK, COLORADO RIVER BASIN, TEXAS, 1971,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-05851

PUBLIC WATER SUPPLIES OF NORTH CAROLINA: PART I. NORTHERN PIEDMONT,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 6D.
W74-05858

LONG-DISTANCE TELEMETRY OF DATA FOR FLOOD FORECASTING,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 4A.
W74-05859

FLOOD HAZARD ANALYSES, SAND CREEK, CITY OF COLORADO SPRINGS, AND EL PASO COUNTY.
Soil Conservation Service, Portland, Oreg.
For primary bibliographic entry see Field 2E.
W74-05860

NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM, FORECAST PROCEDURES.
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 4A.
W74-05861

8. ENGINEERING WORKS

8A. Structures

RESERVOIRS, THEIR EFFECT ON NATURE AND THE ECONOMY, AND PRINCIPLES OF CONSTRUCTION (VODOKHRANILISHCHA, IKH VLIYANIYE NA PRIRODU I KHOZYAYSTVO, PRINTSIPY SOZDANIYA),
A. B. Avakyan.
Akademiya Nauk SSSR Vestnik, No 11, p 42-51, November 1973. 2 fig, 1 tab.

Descriptors: *Reservoirs, *Multiple-purpose reservoirs, *Reservoir construction, Reservoir storage, Usable storage.
Identifiers: *USSR.

Based on estimates made at the USSR Academy of Science's Institute of Water Problems, the total storage of 10,000 of the world's reservoirs already constructed or under construction is about 5,000 cu km or more than four times the average volume of water in stream channels (1,200 cu km). The useful storage is 3,000 cu km, and the area of the reservoir water surface is 400,000 sq km. According to data of the B. Ye. Vedeneyev All-Union Scientific Research Institute of Hydraulic Engineering, the Soviet Union has today about 1,000 reservoirs with a storage of more than 1 million cu m each. The total storage of these reservoirs is 831 cu km, and their useful storage is 406 cu km, which is about 16% and 13%, respectively, of the total and useful storage of the world's reservoirs. More than 98% of the total and useful storage of USSR reservoirs is concentrated in 150 reservoirs having a storage of more than 100 million cu m. By the year 2000 the total storage of the world's reservoirs will increase to 10,000-12,000 cu km and the useful storage will increase to 6,000-7,000 cu km.

Economic and social considerations which determine the need for reservoir construction include public water supply, irrigation, hydroelectric power, navigation, flood mitigation, and recreation. Global distribution of major world reservoirs with a storage of more than 10 billion cu m is mapped, and the total and useful storage of major world reservoirs with a storage of more than 30 cu km is graphed. Basic objectives in the study of problems relating to reservoir design and multipurpose use are outlined. (Josefson-USGS)
W74-05564

GATHRIGHT LAKE, JACKSON RIVER, JAMES RIVER BASIN, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W74-05808

BIRCH LAKE, BIRCH CREEK, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 4A.
W74-05809

NEW MELONES LAKE, STANISLAUS RIVER, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W74-05810

BEACH EROSION CONTROL PROJECT, DELRAY BEACH, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
Available from National Technical Information Service, Springfield, Va, 22151, as EIS-FL-73-0414-F, for $5.00 paper copy, $1.45 microfiche. November 1972. 60 p, 1 map, 8 photo, 2 tab, 2 append.

Descriptors: *Environmental effects, *Dredging, *Erosion, Deterioration, Sediments, Fish, Sessile algae, Beach erosion, Atlantic Ocean, *Florida, Water quality, Federal government, Coasts, Comprehensive planning.
Identifiers: *Environmental Impact Statements, *Delray Beach(Fla), Coastal zone management.

This study deals with beach erosion in the Delray Beach to Boca Raton Inlet. The project consists of the restoration of three miles of Atlantic Ocean Shoreline in Florida. Periodic nourishment will be required to compensate for erosion losses throughout the fifty year life of the project. About 1.8 million cubic yards of material will be dredged from offshore and placed on the beach. The beach will be closed at this time. The dredging will temporarily degrade water quality, cause the beach to be temporarily closed to public use, and will destroy most benthic animals in bottom sediments and cover those in the beach nourishment area. This proposed plan is the only economically feasible one. Fish will be less affected by the project than the sessile invertebrates. The overall impact will probably be insignificant as the offshore borrow area is not near any productive reefs. Increased turbidity will only be of short duration. (Daniels-Florida)
W74-05813

ENGINEERING AND GEOGRAPHICAL PROBLEMS IN THE DESIGN AND OPERATION OF LARGE LOWLAND RESERVOIRS (INZHENERNO-GEOGRAFICHESKIYE PROBLEMY PROYEKTIROVANIYA I EKSPLUATATSII KRUPNYKH RAVNINNYKH VODOKHRANILISHCH).
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 4A.
W74-05845

EARTHQUAKE ANALYSIS OF STRUCTURE-FOUNDATION SYSTEMS,
California Univ., Berkeley. Earthquake Engineering Research Center.
For primary bibliographic entry see Field 8E.
W74-05846

SHORELINE CONSTRUCTION FOR ARTIFICIAL WATER BODIES,
Stabilization Chemicals, Anaheim, Calif. (assignee)
J. H. Glenn.
U.S. Patent No. 3,768,266, 4 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 915, No 5, p 1617, October 30, 1973.

Descriptors: *Retaining walls, *Concrete, *Shore protection, Water resources, *Erosion control, Plastics.
Identifiers: *Artificial water bodies.

Excavation of a trench to outline the periphery of the water body constitutes the first step in construction of the artificial shoreline. The dimensions of the trench may be adapted to specific requirements, although a depth of about 4 feet and a width of about 8 to 10 inches are the preferred dimensions of the trench. The flat side of a premolded plastic section of perhaps 8-15 feet in length is then secured to an upper portion of the trench sidewall, its opposite side being provided with surface irregularities or inequalities closely approximating natural sand or rock formations. The plastic section is thinner than the trench width so as to form an opening between the plastic section and the trench wall. Concrete is then poured into the trench through the opening and will first fill up the bottom portion of the trench below the plastic section and will thereupon occupy the opening in the trench opposite the exposed irregular surface of the pre-molded plastic section. The upper portion of the concrete will thus receive the mirror image of the irregular surface of the plastic section. The plastic section is readily removed from the trench and the irregular surface formed of concrete is exposed. (Sinha-OEIS)
W74-05882

SCIENTIFIC INFORMATION IN THE DECISION TO DAM GLEN CANYON,
California Univ., Davis. Dept. of Geology.
For primary bibliographic entry see Field 6G.
W74-05925

8B. Hydraulics

CELLULAR-BLOCK-LINED GRADE CONTROL STRUCTURE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. P. Fletcher, and J. L. Grace, Jr.
Available from NTIS, Springfield, Va. 22151 as AD-766 692, Price $3.00 printed copy; $1.45 microfiche. Miscellaneous Paper H-73-7, August 1973. 23 p, 2 fig, 3 plate, 10 photo.

Descriptors: *Hydraulic models, *Drops(Structures), Canals, *Concrete structures, Channels.

A practical and inexpensive method of providing for a sudden change in grade of the invert of a trapezoidal channel in order to establish vertical control in a drainage basin subject to or experiencing gully scour was studied in a hydraulic model. A considerable cost savings can be realized if a cellular-block-lined structure can be used in lieu of a conventional reinforced-concrete drop structure. Cellular-block-lined grade control structures can be designed provided the geometric similarity is preserved, the control or throat section is sized sufficiently small to prevent excessive accelera tion and drawdown of flow, and the followin maximum or limiting conditions are not exceeded an approach channel depth less than or equal t the exit channel flow depth; a critical depth o flow in the throat section less than or equal to 4. ft; a critical velocity of flow in the throat sectio less than or equal to 8.9 fps; and a total drop in th elevation or grade change less than 4.0 ft. (Knapp USGS)
W74-05523

HOUSTONHANNEL, GALVESTON BAY TEXAS: REPORT 1--HYDRAULIC AND SALINI TY VERIFICATION,
Army Engineer Waterways Experiment Station Vicksburg, Miss.
W. H. Bobb, R. A. Boland, Jr., and A. J. Banchett
Available from NTIS, Springfield, Va. 22151 a AD-766 693, Price $3.00 in printed copy; $1.45 i microfiche. Technical Report H-73-12, Augus 1973. 59 p, 4 fig, 42 plate.

Descriptors: *Hydraulic models, *Dredging *Saline water intrusion, Salinity, Gulf of Mexico *Channels, Canals, Inland waterways, *Texas.
Identifiers: *Houston Ship Channel(Tex).

The Houston Ship Channel model is a fixed-be model constructed to linear scale ratios of 1:60 horizontally and 1:60 vertically. It is used t reproduce a portion of the Gulf of Mexico ac jacent to the Galveston Harbor Entrance, the Ga veston Bay complex, including Trinity Bay in it entirety, East Bay, a portion of West Bay, th Houston Ship Channel to its upstream boundary i the City of Houston, Texas, and Buffalo Bayo from the Houston Ship Channel turning basin t the confluence of White Oak Bayou. The model i equipped with necessary appurtenances for the ac curate reproduction and measurement of tide tidal currents, salinity intrusion, freshwater in flow, density effects, shoaling, and other impor tant prototype phenomena. The purpose of th model is to determine if the cost of maintenanc dredging can be reduced by proposed plans involv ing channel realignments, partial or complete di ing of connecting bays, sediment traps, dikes i Galveston Bay, local contractions, enlargement and other remedial measures. Model verificatio tests were conducted to make certain that th model hydraulic and salinity regimens were i satisfactory agreement with those of the prot type. The agreements attained are satisfactory; th model can be used to predict behavior of th prototype. (Knapp-USGS)
W74-05531

SELF-CLOSING IRRIGATION PIPE VALVE,
Agricultural Research Service, Fort Collins, Colo
H. R. Haise, and M. L. Payne.
Journal of the Irrigation and Drainage Divisior American Society of Civil Engineers, Vol 98, N IR3, p 517-522, September, 1972. 5 fig, 5 ref.

Descriptors: *Irrigation systems, *Distributio systems, *Valves, *Remote control, Turnout *Pipe flow, Pipes, Irrigation engineering, Irrig tion design.

A low-head self-closing hydraulic diaphragm i rigation valve that operates on water pressure i the pipe distribution system has been develope and successfully tested. The valve requires a pil valve and control lines for remote operation. Pre sure head in the system plus velocity head from pitot tube, and the differential area of the valv combine to make closure possible. Possible use include control of reservoir outlets, water release from riser valves, and routing water in storm sewers to maximize design capabilities. No outsid power source is required. (Skogerbor-Colorad State)
W74-05670

MIXING OF SALINITY-STRATIFIED WATER BY PNEUMATIC BARRIERS. REPORT I: PRELIMINARY INVESTIGATIONS. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 2L.
W74-05701

DESIGNS FOR RUBBLE-MOUND BREAKWATER REPAIRS NAWILIWILI HARBOR, NAWILIWILI, HAWAII. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. A. Jackson, R. Y. Hudson, and J. G. Housley.
Available from NTIS as AD-762 184 PC$3.00, microfiche $1.45. Miscellaneous Paper No. 2-377, February 1960. 67 p, 26 photos, 24 plates.

Descriptors: *Hydraulic models, *Breakwaters, *Harbors, Hawaii, Attenuation.
Identifiers: Rubble-mound breakwaters, Kawai(Hawaii).

A 1:55.5 scale hydraulic model was used to obtain data from which competitive designs could be determined for the repair of the damaged breakwater at Nawiliwili Harbor, Island of Kauai, Hawaii. Proposed designs involved protective cover layers of either salvaged quarrystone, tetrapod, or tribar armor units. It was concluded that: it was not feasible to repair the damaged breakwater with the quarrystones available at Nawiliwili; repair sections constructed of either tribars or tetrapods would provide a stable breakwater; because the height of the selected breakwater crown is low compared with the height of the design waves, it will be necessary to protect the crown of the breakwater from overtopping waves with a concrete cap. The seaward face of the concrete cap should be vertical so that wave action will not wash armor units over the crest of the breakwater. (Sinha-OEIS)
W74-05705

LOCATION AND DESIGN OF WAVE ABSORBER, GARY HARBOR, INDIANA. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. G. Housley.
Available as AD-760 936 PC$3.00, microfiche $1.45. Technical Report No. 2-509 Prepared for United States Steel Corporation, June 1959. 70 p, 8 fig, 8 tab, 8 ref, 17 photos, 18 plates.

Descriptors: *Hydraulics, *Bulkheads, Navigation, *Harbors, Indiana, Attenuation.
Identifiers: Wave absorbers, Gary(Indiana).

Hydraulic model tests were conducted to determine whether navigation conditions in Gary Harbor would be adversely affected by waves reflected from an adjacent vertical-wall bulkhead proposed for construction by the United States Steel Corporation, Gary, Ind. From tests of a 1:150 scale, fixed-bed model of the harbor, it was determined that the proposed bulkhead would reflect waves that would be hazardous to navigation, and that a 4450-ft-long rubble wave absorber would have to be placed along the structure to reduce the heights of reflected waves in the navigation channel to the level of the waves that now occur in the channel. For the waves used in this study an absorber composed of two layers of quarrystone armor units on a 1-on-3.2 slope is required to insure that the heights of waves reflected from the proposed bulkhead into the navigation areas would not be greater than 2 ft. (Sinha-OEIS)
W74-05706

DESIGN OF QUADRIPOD COVER LAYERS FOR RUBBLE-MOUND BREAKWATERS. HYDRAULIC LABORATORY INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. A. Jackson.
Available from NTIS as AD-762 185 PC$3.00 microfiche $1.45. Miscellaneous Paper No. 2-372, January 1960. 14 p, 2 tab, 4 photos, 3 plates.

Descriptors: *Breakwaters, Hydraulics, Structure, Shore protection.
Identifiers: Rubble-mound breakwaters, Quadripods, Armor units.

The information presented represents all test results concerning the stability characteristics of quadripod armor units available as of October 1959. The comprehensive testing program includes tests to determine the relative stability and efficacy of various special shapes of armor units for rubble-mound breakwaters. The stability and porosity of quadripods and tetrapods are essentially the same. Values for K sub delta (an experimental coefficient which is a function of the shape delta of individual armor units and the manner of placing them) and P (the porosity is a percentage) recommended for quadripods placed pell-mell with 2 layers was 8.3 and 50%, respectively. (Sinha-OEIS)
W74-05709

NIVIGATION IMPROVEMENTS IN BARNHART ISLAND-CORWALL ISLAND REACH, ST. LAWRENCE RIVER: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. B. Lipscomb, and A. M. Gill.
Available from NTIS as AD-761 720 PC$3.00 microfiche $1.45. Technical Report No. 2-576, August 1961. 127 p, 3 fig, 55 tab, 29 plates.

Descriptors: Channel flow, *Channel improvement, St. Lawrence River, *Hydraulic models, *Nivigation.

The U.S. St. Lawrence Seaway Development Corporation resorted to hydraulic models to study the channels and other improvement features in the Cornwall Island reach. The investigations were concerned primarily with the improvement of South Channel, a reach about 7 miles long, to satisfy navigation criteria and also to assure continuation of the present 14-ft-draft navigation during construction of improvement plans. Interrelated with the South Channel improvement was the enlargement of North Channel to maintain the established discharge distribution and to obtain maximum benefits for navigation and power. Two models were used in the investigations. Plans were developed which would provide the desired 27-ft navigation depth in South Channel by widening the alignment of the channel on both sides and slightly deepening the natural bed in several places. Plans were also developed for compensating works in North Channel which would maintain the required natural distribution of flow between the channels with the South Channel improvements completed. Tests were made of the effects of various stages of construction of the improvement plans on 14-ft-draft navigation, and a construction schedule that would assure the continuation of navigation at this depth was developed. (Sinha-OEIS)
W74-05712

ABRASION IN PLACE: A MECHANISM FOR ROUNDING AND SIZE REDUCTION OF COARSE SEDIMENTS IN RIVERS,
Colorado State Univ., Fort Collins. Dept. of Earth Resources.
For primary bibliographic entry see Field 2J.
W74-05721

TWO-DIMENSIONAL ANALYSIS OF BACKWATER AT BRIDGES,
University of South Florida, Tampa. Dept. of Structures, Materials, Fluids.
For primary bibliographic entry see Field 2E.
W74-05734

FACTORS DETERMINING BED FORMS OF ALLUVIAL STREAMS,
California Inst. of Tech., Pasadena. W. M. Keck Lab. of Hydraulics and Water Resources.
For primary bibliographic entry see Field 2J.
W74-05735

WATER EXCHANGE IN TWO-LAYER STRATIFIED WATERS,
Royal Inst. of Tech., Stockholm (Sweden). Hydraulic Lab.
For primary bibliographic entry see Field 2L.
W74-05736

FLOW-INDUCED FORCES ON PROTRUDING WALLS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlagen und Wasserversorgung.
E. Naudascher, and F. A. Locher.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY2, Paper 10347, p 295-313, February 1974. 13 fig, 20 ref. ACE Contract DA-22-079-CIVENG-65-30.

Descriptors: *Hydraulics, *Loads(Forces), *Flow around objects, Flow separation, Fluid mechanics, *Hydraulic structures.

A two-dimensional wall of variable thickness protruding from a plane boundary is a basic geometrical configuration encountered in many instances of flow-induced structural vibrations in hydraulic structures. The characteristics of the dynamic forces acting upon the face of the wall parallel to the boundary were studied. The effects of cavitation and of forced periodic oscillations of the wall upon the force fluctuations were investigated as functions of cavitation number and amplitude and frequency of oscillation. There may be several control mechanisms for flow-induced vibrations because of flow reattachment, cavitation, or wall displacement. (Knapp-USGS)
W74-05737

FORM AND FLUVIAL PROCESSES IN ALLUVIAL STREAM CHANNELS,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 2E.
W74-05819

THE MIXING CHARACTERISTICS OF SUMMERGED MULTIPLE-PORT DIFFUSERS FOR HEATED EFFLUENTS IN OPEN CHANNEL FLOW,
Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
For primary bibliographic entry see Field 5B.
W74-05821

VERTICAL MIXING OF HEATED EFFLUENTS IN OPEN-CHANNEL FLOW,
Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
For primary bibliographic entry see Field 5B.
W74-05822

THREE-DIMENSIONAL TURBULENT DIFFUSION FROM POINT SOURCES OF THERMAL POLLUTION IN A RECTANGULAR OPEN CHANNEL,
Delaware Univ., Newark. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W74-05823

RIVER-ICE PROBLEMS: A STATE-OF-THE-ART SURVEY AND ASSESSMENT OF RESEARCH NEEDS.
American Society of Civil Engineers, New York. Hydraulics Div.
For primary bibliographic entry see Field 2C.
W74-05824

HYDRODYNAMICAL STABILITY OF SALT WEDGE,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-05825

TURBULENCE IN WAKES OF ROUGHNESS ELEMENTS,
Blume (John A.) and Associates, Engineers, San Francisco, Calif.
C. K. Chen, and J. A. Roberson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY1, Paper 10257, p 53-67, January 1974. 18 fig, 13 ref, append.

Descriptors: *Turbulent flow, *Pipe flow, *Roughness(Hydraulic), *Reynolds number, Drag, Fluid mechanics, Hydraulics, Shear stress, Turbulence, Pressure drag.

An experimental investigation was made of the turbulent flow in a pipe roughened with hemispheres. The roughness concentration was varied by changing the size of roughness elements which were uniformly distributed on the smooth boundary. Measurements included intensity of turbulence, macroscale of turbulence, Reynolds stress, mean velocity, pressure gradient, drag force, and shear stress on the smooth boundary. Turbulence and velocity measurements were confined to a vertical plane through the wake center line. In the region above the tops of the roughness elements the distributions of the normalized intensities of turbulence, the Reynolds stress, and the macroscale of turbulence in roughened pipe flow are about the same as in smooth pipe. In the region below the tops of the roughness elements at a given Reynolds number and for an increase in the relative roughness, there are corresponding decreases in the normalized longitudinal intensity of turbulence and the Reynolds stress. In the region behind the roughness elements at a given distance above the boundary, the maximum magnitudes of the normalized intensities of turbulence and the Reynolds stress have initially high values. They then decay and approach essentially constant values. The turbulence macroscale is dependent upon the Reynolds number and decreases with an increase in the relative roughness. (Knapp-USGS)
W74-05826

THREE-DIMENSIONAL TURBULENT WALL JETS,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
N. Rajaratnam, and B. S. Pani.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY1, Paper 10294, p 69-83, January 1974. 15 fig, 1 tab, 17 ref, append.

Descriptors: *Jets, *Turbulent flow, Hydraulic similitude, Shear stress, Boundary layers, Turbulent boundary layers, Hydraulics, *Nozzles.

Experiments on three-dimensional turbulent bluff wall jets originating from circular, elliptic, square, rectangular, and equilateral triangular nozzles show that in the region of fully developed flow, the distribution of the axial velocity in the central as well as transverse planes are similar. The velocity scale varies inversely with the axial distance whereas the length scales vary linearly with the axial distance from the respective virtual origins. The square root of the area of the nozzle serves as a convenient length scale in correlating the data for nozzles of different shapes. (Knapp-USGS)
W74-05827

HYDRAULICS AND THERMAL DISPERSION IN AN IRREGULAR ESTUARY,
General Electric Co., Philadelphia, Pa. Re-Entry and Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W74-05828

DECAY OF MASS OSCILLATIONS IN RECTANGULAR BASINS,
Worcester Polytechnic Inst., Mass. Alden Research Labs.
J-C. Shiau, and R. R. Rumer, Jr.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY1, Paper 10261, p 119-136, January 1974. 10 fig, 2 tab, 14 ref, append. EPA Grant WP-00837.

Descriptors: *Seiches, *Hydraulic similitude, *Hydraulic models, *Lakes, Model studies, Waves(Water), Fluid friction, Mathematical models.
Identifiers: *Damping(Waves).

Decay of mass oscillations may be used to determine the scale of friction in a hydraulic model of closed basins. A mathematical model for the damping of the uninodal seiche in a rectangular closed basin utilizing the one-dimensional hydrodynamic channel equation was used as the analytic approach to the problem. Experimental data were compared with the analytical results. The similitude requirement for frictional damping requires equality of the Froude number and the Proudman number in the model and prototype. Through adjustment of boundary friction, model verification can be accomplished when these criteria cannot be met. (Knapp-USGS)
W74-05830

BUBBLY TWO-PHASE FLOW IN HYDRAULIC JUMP,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
F. J. Resch, H. J. Leutheusser, and S. Alemu.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY1, Paper 10297, p 137-149, January 1974. 11 fig, 1 tab, 6 ref, append.

Descriptors: *Hydraulic jump, *Air entrainment, Supercritical flow, Aeration, Critical flow, *Open channel flow.
Identifiers: *Multiphase flow.

Air-entraining roller zones are involved in hydraulic umps in open channels. Hot-film anemometry techniques were used to study these zones. The two phases (air versus water) were identified by a signal threshold. Data are presented on void ratio and average size and statistical size distribution of the entrained air bubbles for jumps with and without fully developed inflow. The state of flow development of the supercritical stream entering the jump has a significant bearing on the resulting flow configuration within the jump body and thus, on the air-entraining capacity of the hydraulic jumps. (Knapp-USGS)
W74-05831

DIFFUSION AND DISPERSION IN OPEN CHANNEL FLOW,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-05833

SEDIMENT TRANSPORT AT LOW SHIELD PARAMETER VALUES,
Norconsult A/S., Oslo (Norway).
For primary bibliographic entry see Field 2J.
W74-05835

HYDRAULIC FRACTURING IN ZONED EART AND ROCKFILL DAMS,
California Univ., Berkeley. Coll. of Engineering.
For primary bibliographic entry see Field 8D.
W74-05855

VORTEX CONTAINMENT OF SUBMERGE JET DISCHARGE,
Connecticut Univ., Storrs. Dept. of Mechanic Engineering.
R. L. Stoy, M. H. Stenhouse, and A. Hsia.
Journal of the Hydraulics Division, Americ Society of Civil Engineers, Vol 99, No HY9, Pro Paper 9999, p 1585-1597, September, 1973, 8 fi 12 ref, 2 append. OWRR/A-050-CONN(1), 1 0001-3807.

Descriptors: Hydraulics, *Hydrodynamics, *Jet Buoyancy, Entrainment, *Vortices, Subsurfac flow, Discharge(Water), Heated water, Powe plants.
Identifiers: *Fluid Flow, *Submerged jets.

The results of an experimental investigation of th discharge of submerged slot jet near a free surfac are presented. In the thermal modeling of sul merged power plant discharges, a vortex which a pears between the jet discharge and the free su face or bottom surface is primarily responsible f jet deflection by causing a reduced pressure c one side of the jet. These results are compared an analysis which is developed to predict the j trajectory, velocity profile, and temperatu profile and the effects of jet submergenc velocity, and buoyancy are studied. The uniqu feature of the submerged slot jet is the presence a confined vortex which acts to move the jet to th surface. The conclusions are: a submerged slot j may be used to contain a pool of heated water ne the jet outlet because of the entrapped vortex; th Froude number is not a significant paramet while the submergence ratio and Richardso number are important in determining the jet patl and the jet path can be accurately predicted by th analysis which includes the effect of the reduce pressure caused by the vortex presenc (Dietchman-Connecticut)
W74-05912

8C. Hydraulic Machinery

HAVASU INTAKE CHANNEL, HAVASU PUMP ING PLANT AND BUCKSKIN MOUNTAIN TUNNEL, ARIZONA-NEW MEXICO (FINA ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Boulder City, Nev. Re gion 3.
Available from National Technical Informatio Service, Springfield, Va, 22151, as EIS-AZ-73 0066-F, $1.45 microfiche. January 1973. 276 p, 1 fig, 6 tab, 22 map.

Descriptors: Environmental effects, Surfac waters, *Intakes, *Pumping plants, Engineerin structures, Tunnels, Tunnel linings, Wate delivery, Flow, Specific capacity, Forebays, Sedi mentation, Stratification, Inflow, Biota, *Arizona *New Mexico.
Identifiers: *Environmental Impact Statements *Lake Havasu(Ariz).

This project involves the construction of th Havasu Intake Channel, Pumping Plant an Buckskin Mountains Tunnel on Lake Havasu i Arizona. These facilities will enable water to b pumped from the Colorado River at Lake Havas to the Central Arizona Project service area. A long-term average of 1.2 million acre feet of wate

ill be pumped annually from Lake Havasu for ıultiple-purpose uses. This new supply of water ill be used to provide flexibility in meeting the emand for water imposed by municipal, industri-, and agricultural users. Construction of the pro-ct will have minimum effect on the environment f the construction site. The aesthetic value of the nmediate area will be altered during construction ıd partially restored upon completion. The pro-ct will result in a minimal impact to the biota of ıe area. About 200 acres, mostly desert land, will e needed for construction. Alternatives con-dered included other diversion points, alternate ater sources, alternatie power sources, selection f only individual segments of the project and no ction at all. (Conko-Florida)
774-05812

D. Soil Mechanics

ANDSLIDES AND RELATED PHENOMENA ERTAINING TO HIGHWAY CONSTRUCTION N OKLAHOMA,
klahoma State Dept. of Highways. Research and evelopment Div.
or primary bibliographic entry see Field 2J.
774-05743

YDRAULIC FRACTURING IN ZONED EARTH ND ROCKFILL DAMS,
alifornia Univ., Berkeley. Coll. of Engineering.
. S. Nobari, K. L. Lee, and J. M. Duncan.
vailable from NTIS Springfield, Va. 22151 as D-766 728 Price $3.00 printed copy; $1.45 icrofiche. Army Engineer Waterways Experi-ent Station, Vicksburg, Mississippi, Contract eport S-73-2, January 1973. 75 p, 29 fig, 14 tab, 14 ef. Contract DACW39-68-C-0078.

escriptors: *Dam failure, *Dam design, *Stress nalysis, Model studies, Rupturing, Engineering, lays, Structural analysis, Structural design, oils, Earth dams, Rockfill dams, Soil mechanics, ensile stress.
dentifiers: *Hydraulic fracturing, Zoned dams.

he phenomenon of hydraulic fracturing in dams as studied under carefully controlled laboratory onditions. An analytical investigation determined he conditions under which the stresses in the ores of zoned dams is reduced sufficiently by rching so that hydraulic fracturing can occur. nalyses were also performed to examine the ef-ectiveness of various countermeasures which can educe the arching and the likelihood of hydraulic racturing. Hydraulic fracturing involves tension ailure, with formation of a crack or fracture on ıe plane of maximum tensile stress. The tensile trengths of clays and silts used as core materials re so small that they may be disregarded. Under onditions of nonuniform stress, hydraulic frac-ıring can occur progressively rather than sud-enly. Initiation of hydraulic fracturing at the up-tream face of the core in a dam thus does not ecessarily mean that the fracture will propagate ntirely across the core. Hydraulic fracturing is ıore likely in a high dam than in a low dam. The kelihood of hydraulic fracturing may be reduced y making the core wider, compacting the core at a ower water content, using transition zones which re less stiff than the shells, and using a sloping ore rather than a central core. (Knapp-USGS)
W74-05855

E. Rock Mechanics and Geology

ARTHQUAKE ANALYSIS OF STRUCTURE-OUNDATION SYSTEMS,
alifornia Univ., Berkeley. Earthquake Engineer-ng Research Center.
. K. Vaish, and A. K. Chopra.
Available from NTIS, Springfield, Va 22151, as AD-766 272 for $4.50 printed copy; $1.45 microfiche. Report No EERC 73-9, May 1973. 132 p, 42 fig, 1 tab, 36 fig. Army DACW73-71-C-0051.

Descriptors: *Earthquake, *Foundation investigations, Earthquake engineering, Computer programs, Seismic design, Structural design, Finite element analysis, Mathematical models.

A computationally efficient procedure for the linear earthquake analysis of structure-foundation systems is specially suited to finite element solutions of complex shaped structures on large, layered foundations. The procedure is very general in scope, being applicable to a large variety of structure-foundation interaction problems. An explicit formulation of the procedure is presented for a plane strain idealization of a dam foundation system. The procedure utilizes a substructure approach. The foundation is analyzed first, independently of the structure, to obtain its frequency dependent compliance characteristics at the connection nodes with the structure. Equations of motion for the structure are then written, in the frequency domain incorporating the effect of the foundation, the input to the problem being the freefield motion of the structural base. The substructure approach allows a more detailed modeling of the structure, at the same time resulting in a greater flexibility in the selection of the analysis procedure for the foundation and a greater efficiency in numerical computation. The frequency dependent equations of motion for the structure are solved very efficiently by transformation to a generalized coordinate system (Ritz Method), where a few generalized shapes can adequately express the structural response. It is shown that the normal mode shapes of an associated linear system--one that takes the static values of the foundation compliances--serve extremely well as the sought generalized shapes. A computer program performs the analysis. (Knapp-USGS)
W74-05846

8F. Concrete

INVESTIGATION OF POROUS PAVEMENTS FOR URBAN RUNOFF CONTROL,
Franklin Inst. Research Labs., Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W74-05411

8I. Fisheries Engineering

SUMMER STORAGE OF ENERGY AND ITS USE FOR WINTER METABOLISM AND GONAD MATURATION IN AMERICAN PLAICE (HIPPOGLOSSOIDES PLATESSOIDES),
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
For primary bibliographic entry see Field 2L.
W74-05463

ECOLOGY OF FLOODPLAIN POOLS IN THE KASKASKIA RIVER BASIN OF ILLINOIS,
Illinois State Natural History Survey, Urbana.
For primary bibliographic entry see Field 2H.
W74-05536

BIOLOGICAL STUDIES ON THE FRESHWATER SHRIMPS IN KOREA: 4. THE ECOLOGY OF MACROBRACHIUM NIPPONENSIS (DE HAAN) (IN KOREAN),
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 2I.
W74-05583

FISHWAYS AT DAMS OR OBSTRUCTIONS.
For primary bibliographic entry see Field 6E.
W74-05603

ECONOMICS OF AQUACULTURE DEVELOPMENT,
Hawaii Univ., Honolulu. Sea Grant Program.
For primary bibliographic entry see Field 6C.
W74-05646

SOME REMARKS ON AQUACULTURE,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 6C.
W74-05647

AQUACULTURE: ECONOMIC FEASIBILITY IN THE GREAT LAKES AREA,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W74-05648

FISHERY PROBLEMS AND THE U.S. DRAFT ARTICLE,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-05650

ALTERNATIVES TO THE CURRENT U.S. POSITION ON FISHERIES,
Miami Univ., Coral Gables, Fla. School of Law.
For primary bibliographic entry see Field 6E.
W74-05653

FOREIGN FISHING OFF THE SOUTHEASTERN UNITED STATES UNDER THE CURRENTLY ACCEPTED CONTIGUOUS SEA LIMITATION,
National Marine Fisheries Service, St. Petersburg, Fla. Southeast Region.
For primary bibliographic entry see Field 6E.
W74-05654

AQUACULTURE: PROBLEMS WITH THE PROMISE,
For primary bibliographic entry see Field 3F.
W74-05802

POTENTIAL DANGER FROM THE INDIAN CATFISH, HETEROPNEUSTES FOSSILIS (BLOCH),
California State Polytechnic Coll., Pomona. Dept. of Biological Sciences.
E. T. Roche, and J. A. St. Amant.
Calif Fish Game. Vol 59, No 2, p 144-145. 1973.
Identifiers: Heteropneustes-fossilis, *Indian catfish, *California, *Catfish handling, *Fish imports(Illegal).

The dangers of handling Indian catfish are pointed out. It is illegal to import this fish into California. Nevertheless, these fish show up occasionally in shipments to fish dealers.--Copyright 1973, Biological Abstracts, Inc.
W74-05829

FISH ESCALATOR,
S. E. Ogden.
U.S. Patent No. 3,783,623, 4 p, 9 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 918, No 2, p 577, January 8, 1974.

Descriptors: *Patents, *Fish passages, Dams, *Fish ladders, Conveyance structures, Fish migration.
Identifiers: *Fish escalators.

A fish elevator or escalator is designed to provide a means whereby fish may be passed through, over or around a dam. The elevator has a pair of parallel tubular passageways having one set of identical corresponding transverse dimensions and a second set of different corresponding dimensions. Endless chains are arranged in parallel

reaches with one reach extending along the midpoint of the adjacent side of one of the passageways and the other reach of the chain extending midway along the adjacent side of the other passageway. Corresponding reaches of the chains have partitions secured between them. The partitions are mounted so as to be slightly oscillatable and held in tight sliding engagement with the associated passageways. The elevator works somewhat in the manner of an undershot waterwheel with means provided to admit fish to be elevated to the higher level or lowered to the lower level into the compartments between adjacent partitions. (Sinha-OEIS)
W74-05903

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, FOURTH VOLUME.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 6A.
W74-05401

WATER QUALITY CRITERIA, SECOND EDITION.
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 5A.
W74-05417

OCEAN AND WATER RESOURCES ENGINEERING REPORTS COLLEGE OF ENGINEERING UNIVERSITY OF CALIFORNIA BERKELEY.
California Univ., Berkeley. Water Resources Center.
Available from NTIS as COM 73-11195 PC$4.50 microfiche $1.45. Archives Series Report No. 23, Prepared for NOAA, Office of Sea Grant, May 1973. 135 p. NOAA A/DC-1.

Descriptors: *Bibliographies, *Sanitary engineering, *Naval architecture, *Hydraulic engineering, *Water resources, *Desalination, Oceanography.

This compilation lists titles in those series related to ocean and water resources engineering which have been published in the College of Engineering, University of California, Berkeley, over the past thrity years. The compilation is arranged in sections according to office or laboratory from which the series emanated; arrangement within each section is sequential based on series report number. Separate author and subject indexes are provided. The offices and laboratories are identified as: Institute of Engineering Research, Sanitary Engineering Research Laboratory, Hydraulic Engineering Laboratory, Sea Water Conversion Laboratory, Naval Architecture, Committee on Ocean Engineering, and Waste Heat Management. (Sinha-OEIS)
W74-05707

WATER RESOURCES TECHNICAL INFORMATION SERVICES.
Australian Water Resources Council, Canberra.
For primary bibliographic entry see Field 10D.
W74-05739

10D. Specialized Information Center Services

WATER RESOURCES TECHNICAL INFORMATION SERVICES.
Australian Water Resources Council, Canberra. Hydrological Series No 7, 1973. 69 p, 11 fig, 5 tab, 59 ref, 4 append.

Descriptors: *Information exchange, *Abstracts, *Australia, Information retrieval, Libraries, Publications, Documentation.
Identifiers: *Information centers.

The methods by which water resources technical information is disseminated in Australia and other countries were surveyed to establish the extent of the need for improvement of technical information services. The level of service provided by libraries in the water industry in Australia is low. This is the result of an inadequate number of professionally qualified librarians, an inadequate number of nonprofessional library personnel, and a low level of expenditure on library acquisitions and services. In general there is either a lack of recognition of the importance of scientific and technical information or a lack of understanding that a good library is an essential part of the means by which the information is obtained. Water libraries generally report to management at a level too low to be effective. It is proposed that a comprehensive information dissemination system be set up under the Australian Water Resources Council; the Council would be advised by a permanent committee on information services. A national water resources information center should coordinate the flow of information by the regular undexing of all documents acquired by the libraries in the system, act as a referral center for data, maintain information on current water research in Australia, and provide retrospective search and current awareness services. (Knapp-USGS)
W74-05739

10F. Preparation Of Reviews

WATER QUALITY CRITERIA, SECOND EDITION.
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 05A.
W74-05417

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Burke V. Colley (Quiet Title Action Involving Accretion).
W74-05787 6E

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Oil Accumulator,
W74-05688 5G

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

Subject Fields

- I NATURE OF WATER
- II WATER CYCLE
- III WATER SUPPLY AUGMENTATION AND CONSERVATION
- IV WATER QUANTITY MANAGEMENT AND CONTROL
- V WATER QUALITY MANAGEMENT AND PROTECTION
- VI WATER RESOURCES PLANNING
- VII RESOURCES DATA
- VIII ENGINEERING WORKS
- IX MANPOWER, GRANTS, AND FACILITIES
- X SCIENTIFIC AND TECHNICAL INFORMATION

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 7, NUMBER 12
JUNE 15, 1974

W74-05951 -- W74-06500

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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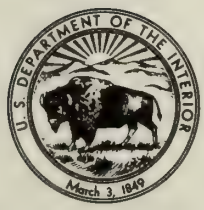
SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior



VOLUME 7, NUMBER 12
JUNE 15, 1974

W74-05951 – 274-06500

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
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Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
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05 WATER QUALITY MANAGEMENT AND PROTECTION
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

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Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

NMR STUDIES OF WATER ADSORBED ON A NUMBER OF SILICA SURFACES,
Nottingham Univ. (England). Dept. of Physics.
For primary bibliographic entry see Field 2K.
W74-06405

2. WATER CYCLE

2A. General

SENSITIVITY ANALYSIS OF A THUNDERSTORM RAINFALL MODEL,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2B.
W74-06101

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE DALLAS, TEXAS METROPOLITAN AREA, 1971,
Geological Survey, Austin, Tex.
B. C. Massey.
Data Report, 1973. 84 p, 4 fig, 3 tab, 6 ref.

Descriptors: *Urban hydrology, *Hydrologic data, *Texas, Urban runoff, Stream gages, Runoff, Rainfall-runoff relationships, Data collections, Precipitation(Atmospheric), Flood data.
Identifiers: *Dallas(Tex).

Hydrologic investigations of urban watersheds in Texas were begun by the U.S. Geological Survey in 1954. These studies are now in progress in Austin, Dallas, Dallas County, Fort Worth, Houston, and San Antonio. In August 1961, the Geological Survey in cooperation with the city of Dallas began a program of investigations designed to evaluate hydrologic factors affecting floods on several small streams in Dallas. The objectives of the Dallas area program are: to determine, on the basis of historical data and hydrologic analyses, the magnitude, frequency, and areal extent of flooding; to document and define floods of greater than ordinary magnitude; and to determine the effect of urban development on flood peaks and volume. The studies involve the collection of precipitation, runoff, and flood-evaluation data in seven drainage basins within the city of Dallas and in three drainage basins outside the city in Dallas County. Two of the seven study areas in Dallas have headwaters in rural areas outside the city limits, but the largest part of each drainage basin is within the city. (Knapp-USGS)
W74-06288

DENDROCLIMATIC HISTORY OF SOUTHWESTERN UNITED STATES,
Arizona Univ., Tucson. Lab. of Tree-Ring Research.
For primary bibliographic entry see Field 2B.
W74-06290

2B. Precipitation

SENSITIVITY ANALYSIS OF A THUNDERSTORM RAINFALL MODEL,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
J. R. Wallace, and K.-L. L. Wang.
Available from the National Technical Information Service as PB-230 695; $4.00 in paper copy, $1.45 in microfiche. Environmental Resources Center, Georgia Institute of Technology, Atlanta, Report ERC-0374, January 1974, 73 p, 23 fig, 3 tab, 6 ref. OWRR A-036-GA(2). 14-31-0001-3810.

Descriptors: *Thunderstorms, *Storm structure, *Artificial storms, *Rainfall simulators, Precipitation(Atmospheric), Cloud physics, Rainfall intensity, *Georgia, *Coastal plains, Simulation analysis, Model studies.
Identifiers: Tunderstorm cells, Thunderstorm simulation, *Sensitivity analysis.

In a sensitivity analysis of a previously developed digital model for the stochastic simulation of thunderstorm rainfall, patterns of rainfall were generated for each of several combinations of some key parameters of the model. Statistics based on the depth, duration, and intensity of the rainfall were computed from a set of generated storms and compared with similar statistics computed from another set of storms generated after one of the model parameters had been changed by a predetermined amount. The parameters studied (1) the parameter which establishes the spatial distribution of rainfall intensity within the thunderstorm cell, (2) the cell duration, and (3) the maximum size attained by the cell. The effects of the distribution coefficient on the rainfall at the maximum raingage were small. The rainfall characteristics were strongly affected by variations in the mean cell duration because, in the model, the maximum rainfall intensity is directly related to storm duration and because cells have an increasing tendency to merge and overlap when their duration is increased. The response of the model to variations in cell size were similar to those due to variations in cell duration but were less pronounced. The model is capable of reproducing the rainfall characteristics as measured in the field; however, it is recommended that the same parameter values not be used, unless they can be varified with local data, to generate thunderstorm rainfall for localities where rainfall characteristics are likely to differ significantly from those in the Georgia Coastal Plains.
W74-06101

APPRAISAL OF THE QUALITY OF GROUND WATER IN THE HELENA VALLEY, MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 2F.
W74-06269

DENDROCLIMATIC HISTORY OF SOUTHWESTERN UNITED STATES,
Arizona Univ., Tucson. Lab. of Tree-Ring Research.
H. C. Fritts, and E. H. Cathey.
Final Report for NOAA, Environmental Data Service, November 30, 1971. 48 p, 9 fig, 39 ref. NOAA 1-35241.

Descriptors: *Southwest U.S., *Paleoclimatology, *Weather data, *Climatic data, History, Climatology, Data collections, Meteorological data, Dendrochronology.
Identifiers: *Dendroclimatology.

Information is compiled on the climate of southwestern United States. This report on the present climate of the Colorado Plateau provides background information for a study of significant historical climatic events of western North America. There appears to be considerable variability of climate over the century. A steep gradient of high moisture along the Pacific coast and low moisture east of the Rocky Mountains is apparent for 1801-1810. The Great Basin and the northern Colorado Plateau became more moist during 1811-1820. Moisture is more abundant in the extreme Southwest from 1926-1840, as the climate of California, Oregon, and Washington becomes dryer, 1836-1850. During the middle of the century the Great Basin is dry. In the last 4 decades of the century, Arizona and New Mexico are generally dry, while areas of high and low moisture vary in their positions along the West Coast. The severity of storms may have increased late in the century. The circulation over the Pacific Ocean appears least zonal early in the century, becoming more zonal toward the end of the century. The decades 1811-1820 and 1851-1860 show marked changes within the decade of zonal to weakly zonal conditions. (Knapp-USGS)
W74-06290

A BLOCKED MINIMAL TROPICAL DEPRESSION BECOMES A STORM OF RARE OCCURRENCE,
National Weather Service, Quincy, Fla.
D. R. Davis, and W. C. Bridges.
Available from NTIS, Springfield, Va. 22151 NOAA NWS SR-59, Price $3.00 printed copy; $1.45 microfiche. National Oceanic and Atmospheric Administration Technical Memorandum NWS SR-59, October 1971. 18 p, 15 fig, 2 tab, 11 ref.

Descriptors: *Tropical cyclones, *Storms, *Florida, *Weather patterns, Floods, Storm runoff, Rain, Rainfall, Historic floods, Meteorology, Storm structure, Synoptic analysis.

A small tropical low, marginal in intensity between a depression and disturbance, moved out of the Gulf of Mexico on September 19-20, 1969. An absence of steering currents aloft and the blocking action of a surface high caused the low to become stationary on the Florida coast for approximately 48 hours. Torrential, record-breaking rains occurred in a small area 60-65 miles to the east and 50 miles inland from the point where the low made landfall. Record-breaking floods resulted. The 23-inch maximum rainfall in 1969 was about 9 inches greater than the previous maximum rainfall of record produced by a 1924 tropical storm in the same area. The location of the area of maximum rainfall, with respect to the point of landfall of the low's center, closely follows the pattern previously reported for the more intense hurricanes and tropical storms. (Knapp-USGS)
W74-06357

TOWARD RADSCAT MEASUREMENTS OVER THE SEA AND THEIR INTERPRETATION,
Kansas Univ./Center for Research, Inc., Lawrence. Space Technology Center.
For primary bibliographic entry see Field 7B.
W74-06361

TABLES AND CONVERSIONS FOR MICROCLIMATOLOGY,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
J. M. Brown.
USDA Forest Service General Technical Report NC-8, 1973. 31 p, 10 fig, 12 tab, 6 ref.

Descriptors: *Microclimatology, Microenvironment, *Precipitation(Atmospheric), *Solar radiation, *Hygrometry, *Meteorology, Ecology, Equations, Mathematics, Climatology, Plant ecology, Graphical methods, Data collections.
Identifiers: Nomograms, *Conversion factors.

A series of tables, charts, and conversion factors are presented for use in microclimatic and ecological studies. These graphic aids provide solutions to various equations of radiant energy exchange, solar radiation, psychrometric and precipitation data, and measuring unit conversions. (Brown-IPC)
W74-06389

MEAN PRECIPITATION-HOURS FOR THE CONTERMINOUS UNITED STATES,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.

D. A. Haines.
USDA Forest Service Research Paper NC-98, 1973. 19 p, 2 fig, 2 tab, 26 maps, 12 ref.

Descriptors: *Climatology, Meteorology, *Precipitation(Atmospheric), *United States, Geographical regions, Statistical methods, *Data collections, *Mapping, *Climatic data.

Patterns of mean precipitation hours per day and month for the continental U.S.A. are presented graphically and discussed with regard to trends, statistical aspects, and computational procedures. (Brown-IPC)
W74-06390

COASTAL WEATHER, TIDES AND WIND WAVES OF THE NORTHERN GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W74-06431

ON THE CAUSES OF ARIDITY ALONG A SELECTED GROUP OF COASTS,
Wisconsin Univ., Milwaukee. Dept. of Geography.
P. E. Lydolph.
In: Coastal Deserts, their natural and human environments, ed. by D.H.K. Amiran and A.W. Wilson, University of Arizona Press, Tucson, 1973. p 67-72, 2 fig, 5 ref.

Descriptors: *Coasts, *Arid lands, *Air circulation, *Winds, Arid climates, Deserts, Semiarid climates, Climatic zones, Climatic data, Droughts, Climatology, Seasonal, Atmosphere, Meteorology, Precipitation(Atmospheric), Topography, Weather, Land forming, Geomorphology.
Identifiers: *Peru.

Coastal deserts have many features in common: they are found at similar latitudes in both hemispheres on the western coasts of continents, and the rainfall distribution with latitude in these areas shows great similarity. These similarities obtain for the five principal coastal deserts throughout the year. The aridity in these zones is closely associated with their active contact with the paralleling flows of atmospheric and oceanic circulations. A theory associating aridity with the differences in wind speed associated with changes of surface friction is also set forth, as in Heinz Lettau's theory on coastal arid zone formation. This theory applies to meridionally-oriented long-sloping terrain in coastal areas where pressure gradients develop from differential heating in the diurnal cycle. This induces a fluctuating jet stream perpendicular to the pressure gradient and thus parallel to the coast. The variability of the stream in moisture content with time of day and seasonal directional alteration accounts for the aridity of the coastal regions involved. This model is somewhat supported by observed climatic conditions of a meteorologic study of Peru. (Muller-Arizona)
W74-06469

ON THE ORIGIN OF THE DRY CLIMATE IN NORTHERN SOUTH AMERICA AND THE SOUTHERN CARIBBEAN,
Oregon State Univ., Corvallis. Dept. of Geography.
J. F. Lahey.
In: Coastal Deserts, their natural and human environments, ed. by D.H.K. Amiran and A.W. Wilson, University of Arizona Press, Tucson, 1973. p 75-90, 36 fig, 1 tab, 4 ref.

Descriptors: *Arid lands, *Arid climates, Climatology, Atmosphere, Atmospheric pressure, Climatic zones, Climatic data, Droughts, Meteorology, Orography, Precipitation(Atmospheric), Temperature, Topography, Weather data, Winds, *South America.
Identifiers: *Caribbean Sea.

Venezuela, Colombia, and the Netherlands West Indies occupy the arid northern coast of South America. Their climate is characterized by extended dry periods in late winter and spring, a summer of light and scattered rainfall, a late summer of increasingly frequent extended droughts, followed by a season of increased frequency of scattered light rains of early fall, and a primarily rainy season until late January, followed a season of decreasing widespread rains to complete the cycle. A detailed analysis of the dry-area windfields through the year in this region show that these fields position the hemispheric cyclones and anticyclones in a manner which accounts for the temporal and spatial variability observed. The orography of the region and the thermal features of the earth as they affect airflow and precipitation in the region are also analyzed from a causal point of view with respect climate. A seasonal description of flow configurations of the upper atmosphere (mean 500-millibar levels) and a demonstration of their relationship to the seasonal variations of aridity in the study area are included. (Muller-Arizona)
W74-06470

NEW EVIDENCE ON THE CLIMATIC CONTROLS ALONG THE PERUVIAN COASTS,
Wisconsin Univ., Milwaukee. Dept. of Geography.
For primary bibliographic entry see Field 6B.
W74-06471

THE COASTAL DESERT OF CHILE,
O. R. Borgel.
In: Coastal Deserts, their natural and human environments, ed. by D. H. K. Amiran, and A. W. Wilson. University of Arizona Press, Tucson, 1973, p 111-114. 6 ref.

Descriptors: *Arid climates, *Coastal plains, *Orography, *Desert plants, Atmospheric pressure, Precipitation(Atmospheric), Climatic zones, *Meteorology, Droughts, Topography, Weather, South America, Deserts, Environmental effects, Groundwater.
Identifiers: *Chile.

The location of Chile on the fault scarp along the East Pacific situates it so that only a narrow continental shelf and small coastal plain are available for the transition from a marine to a terrestrial environment. The Humboldt Current imposes thermal inversions on the area which cause zones of aridity that extend deep into the continent. Vegetation is virtually non existent in the deserts of the Chilean coast, primarily due to the destruction of the native tamarugo which was used for fuel for the local nitrate industry at the end of the last century. There are indications that the groundwater resources of the area, which have been thought sufficient until recently, are diminishing. These conditions are discouraging to the development and maintenance of local agriculture. The geomorphology, drainage, and vegetation of the area are described. (Muller-Arizona)
W74-06473

CLIMATIC PROFILE OF THE NORTH CHILEAN DESERT AT LATITUDE 20 DEGREES SOUTH,
Saskatchewan Univ., Regina. Dept. of Grography.
L. C. Caviedes.
In: Coastal Deserts, their natural and human environments, ed. by D. H. K. Amiran, and A. W. Wilson, University of Arizona Press, Tucson, 1973, p 115-121. 3 fig, 5 tab, 18 ref.

Descriptors: *Arid lands, *Arid climates, Climatology, *Anticyclones, *Ocean currents, *Topography, Atmosphere, Atmospheric pressure, Climatic zones, Climatic data, Meteorology, Droughts, Orography, Precipitation(Atmospheric), Clouds, Coastal plains.
Identifiers: *Chile.

Climatic factors affecting the North Chilean desert are evaluated and their relationships to the various types of arid climate found in the region are analyzed. The landscape of the area is divided into the Coastal Cordillera, the central plateau, and the Cordillera of the Andes, all in north-south alignment. Climatically the region can be divided into the coastal desert, pampas, the Andean piedmont, and the arid high Andes. The climate of the area is attributable to the interaction of the four elements: the location of the area on the margin of the South Pacific anticyclone, the proximity to the cold Humboldt current, the atmospheric subsidence in the area with the resultant deficit in humidity, and influence of topography. The interaction of these parameters in the environment of the North Chilean Desert is discussed in terms of arid climate causing conditions. (Muller-Arizona)
W74-06475

THE PLIO-QUATERNARY CLIMATIC CHANGES ALONG THE SEMIARID SEABOARD OF CHILE,
Tunis Univ. (Tunisia). Dept. of Geography.
R. Paskoff.
In: Coastal Deserts, their natural and human environments, ed. by D. H. K. Amiran, and A. W. Wilson. University of Arizona Press, Tucson, 1973, p 147-151. 2 fig, 14 ref.

Descriptors: *Climatology, *Geomorphology, *Quaternary period, *Paleoclimatology, Landforms, Vegetation, Climatic zones, South America, Environment, Humidity, Meteorology, Paleohydrology, Coasts.
Identifiers: *Chile.

The Plio-Quaternary changes of climate along the semiarid coastal region of Chile are discussed. Two principal conclusions are made. First, the end of the Tertiary probably had a climate of the warm humid tropical type with dry seasons of varying importance; it changed toward the Quaternary with a reduction in temperature and rainfall. Second, humid alternating phases characterize the Pleistocene, accompanied by a cooling of the atmosphere and dry periods of warming. These results correlate with the worldwide climatic estimates for the subtropical latitudes. Although the current climate in the region is that of a superarid desert, the geomorphologic features of the area indicate more humid periods in its geologic history. These features are listed and discussed. (Muller-Arizona)
W74-06478

CLIMATIC-GEOMORPHOLOGICAL ZONES AND LAND UTILIZATION IN THE COASTAL DESERTS OF THE NORTH SAHARA,
Stuttgart Univ. (West Germany). Geographisches Institut.
For primary bibliographic entry see Field 4A.
W74-06480

ECONOMIC DEVELOPMENT OF THE AUSTRALIAN COASTAL DESERTS,
Western Australia Univ., Nedlands.
For primary bibliographic entry see Field 6B.
W74-06484

2C. Snow, Ice, and Frost

EXTRA-TERRESTRIAL MN-53 IN ANTARCTIC ICE,
Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
R. Bibron, R. Chesselet, G. Crozaz, G. Leger, and J. P. Mennessier.
Earth and Planetary Science Letters, Vol 21, No 2, p 109-116, January 1974, 1 tab, 26 ref.

Descriptors: *Manganese, *Glaciers, *Antarctic, Tracers, Dusts, Fallout.
Identifiers: Extraterrestrial manganese.

Mn-53 is a radionuclide linked specifically to interplanetary dust. Snow samples collected on the Eastern Antarctic Plateau in the vicinity of Plateau Station were analyzed for Mn-53. The measurements were carried out by neutron activation and X-ray spectrometry on three samples weighing a few hundred kg and each covering the time interval 1935-1950. The specific activity of Mn-53 was 0.82 plus or minus 0.17 disintegration per min per 1000 tons of snow. The bulk of the Mn-53 found at Plateau Station is associated with interplanetary dust in which it had been produced by the action of solar protons on iron. The deposition rate of extraterrestrial dustborne iron must be between 0.000013 and 0.00013 g per sq m per year at Plateau Station. These results support jointly with other studies the concept of an interplanetary zodiacal cloud of dust with a chemical composition and density not essentially different from chondritic meteorites, with a relatively flat grain size distribution and a mass influx to the earth of the order of 100,000 tons per yr. (Knapp-USGS)
W74-05991

BOMB-PRODUCED TRITIUM IN THE ANTARCTIC OCEAN,
Scripp: Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5B.
W74-05993

PERMAFROST: RELATION BETWEEN ICE CONTENT AND DIELECTRIC LOSSES AT 100 DEG K,
California Univ., Berkeley. Dept. of Geosciences.
R. Alvarez.
Earth and Planetary Science Letters, Vol 20, No 3, p 409-414, November 1973. 4 fig, 2 tab, 15 ref. NASA Grant NGR 05-003-572.

Descriptors: *Permafrost, *Ice, *Frozen ground, *Electrical studies, Frozen soils, Instrumentation.
Identifiers: Dielectric effect.

The dielectric response of permafrost at 100 deg K was analyzed at ice contents from 1% to 18.6%. The distributions obtained correspond to dielectric relaxations of the Cole-Cole type, with maximum losses occurring in the 30 to 600 Hz frequency range. The logarithms of such maxima depend linearly on the permafrost ice content, two regions of linear variation being defined above and below 3.6% ice content. Such relations point out the feasibility of determining ice content in permafrost by electromagnetic means. (Knapp-USGS)
W74-05994

GLACIERS--A PICTURE STORY,
M. Hill.
California Geology, Vol 27, No 2, p 23-44, February 1974. 37 fig, 10 ref.

Descriptors: *Glaciers, *Glaciology, Glaciohydrology, Melt water, *Reviews, Alaska, California.

There are about 1100 glaciers in the mountains of the western states, and another 5000 cover much of Alaska. Most of the approximately 80 glaciers in California lie in cirques. They are all very small; few are more than a mile in length. Glaciers, glacial movement, sediment transport, and meltwater hydrology are illustrated with 37 figures in this review intended for general readership. (Knapp-USGS)
W74-06276

AUTOMATIC COLLECTION AND TRANSMISSION OF HYDROLOGICAL OBSERVATIONS.
World Meteorological Organization, Geneva(Switzerland).
For primary bibliographic entry see Field 7B.
W74-06287

SNOW SURVEYS FROM EARTH SATELLITES--A TECHNICAL REVIEW OF METHODS.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 7B.
W74-06295

STANDARDIZATION IN HYDROLOGY AND RELATED FIELDS.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 7C.
W74-06298

NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM--SNOW ACCUMULATION AND ABLATION MODEL,
National Weather Service, Silver Spring, Md.
E. A. Anderson.
Technical Memorandum NWS HYDRO-17, November 1973. 217 p.

Descriptors: *Computer programs, *Snowmelt, *Mathematical models, Rainfall-runoff relationships, Streamflow forecasting, Runoff forecasting, Snowfall, Ablation, Water yield.

Described are a model of the snow accumulation and ablation process and the associated computer subroutines and programs which enable the model to be used in conjunction with the National Weather Service River Forecast System. Guidelines and methods for determining model parameter values for a given area are also presented. Even though the snow subroutines are written for use with the NWSRFS, the snow accumulation and ablation model itself can be used with almost any soil-moisture accounting (rainfall-runoff relationship) and channel routing procedure. The output from the snow model would be the input to the soil-moisture accounting procedure. The output from the snow model is snowpack outflow (snowmelt water and rainwater leaving the snowpack) plus rain that fell on bare ground. The snow accumulation and ablation model uses air temperature as the sole index to energy exchange across the snow-air interface. (Knapp-USGS)
W74-06370

AREAL SNOW COVER OBSERVATIONS IN THE CENTRAL ROCKIES, COLORADO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
A. D. Haeffner, and C. F. Leaf.
USDA Forest Service General Technical Report RM-5, Nov. 1973. 15 p, 8 fig, 4 tab, 16 ref.

Descriptors: Snow, *Snowmelt, *Snow surveys, *Rocky Mountain Region, *Colorado, Watersheds(Basins), Hydrology, Areal, Mapping, Aerial photography, Streamflow, Water balance, Data collections, *Forecasting, Projections.
Identifiers: Fraser Experimental Forest(Colo).

Photographic records of areal snow cover depletion during the 1964-71 snowmelt seasons in the Fraser Experimental Forest, and in the Park Range from 1966-71, are summarized. Included are detailed estimates of snow cover extent on more than 90 hydrologic subunits which comprise the six watersheds photographed. Applications of these data in streamflow forecasting, water balance analyses, and snow cover duration are suggested. (Brown-IPC)
W74-06391

NMR STUDIES OF WATER ADSORBED ON A NUMBER OF SILICA SURFACES,
Nottingham Univ. (England). Dept. of Physics.
For primary bibliographic entry see Field 2K.
W74-06405

REGIONAL SEDIMENT YIELD ANALYSIS OF ALASKA STREAMS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2J.
W74-06440

DISTANCES OF FLOWAGE OF SNOW AVALANCHES IN THE CENTRAL AND WESTERN CAUCASUS (DAL'NOSTI VYBROSA SNEZHNYKH LAVIN NA TSENTRAL'NOM I ZAPADNOM KAVKAZE),
Moscow State Univ. (USSR). Problemnaya Laboratoriya Nezhnykh Lavin i Selei.
V. P. Blagoveshchenskiy.
Vestnik Moskovskogo Universiteta, Seriya V, Geografiya, No 6, p 95-97, November-December 1973. 1 tab, 5 ref.

Descriptors: *Avalanches, *Snow, *Distance, Geomorphology, Slopes, Climatology.
Identifiers: *USSR(Caucasus).

Determination of maximum distance of flowage of snow avalanches in the Central and Western Caucasus was based on data collected during field work and aerial photo interpretation in upper reaches of the Bol'shoy Zelenchuk and Baksan River valleys. Differences observed in distances of flowage of avalanches in the Central and Western Caucasus are due mainly to geomorphological differences in the regions. The distance of flowage increases with increasing size and decreasing slope angle of the avalanche catchment area. Analytical expressions are obtained for relating avalanche-flowage distance and air-wave formation to size and slope inclination of the catchment area. (Josefson-USGS)
W74-06451

A PRELIMINARY ASSESSMENT OF SNOWFALL INTERCEPTION IN ARIZONA PONDEROSA PINE FOREST,
Arizona Univ., Tucson. Dept. of Watershed Management.
L. C. Tennyson, P. F. Ffolliott, and D. B. Thorud.
In: Hydrology and Water Resources in Arizona and the Southwest, Proc. of the Arizona Section--American Water Resources Association, and the Hydrology Section--Arizona Academy of Science, Tucson, Arizona, May 4-5, 1973, Vol 3, p 17-20 (1973). 1 fig, 8 ref.

Descriptors: *Snowfall, *Interception, *Snow removal, *Arizona, *Ponderosa pine trees, Snowpack, Snowmelt, Stemflow, Canopy, Water yield improvement, Wind erosion.

A preliminary assessment and ranking of the relative significance of five processes that may contribute to snow removal from ponderosa pine forest canopies was made, including wind erosion of canopy snow, snowslide from the canopy, stemflow, vapor transport from melt water, and vapor transport of canopy snow. The first three represent delayed delivery rather than net water loss. A snow load index was obtained through use of time lapse photography of the study site canopy, while incoming solar radiation and atmospheric processes were monitored. The snow load index was expressed as a ratio of forest canopy area covered with snow to the total canopy area. Results obtained over a 4-day period following a six-hour snowstorm showed that snow removal by snowslide and wind erosion was of significant importance, while vapor transport of melt water and canopy snow, stemflow, and dripping of melt water was of comparatively minor importance. (Mastic-Arizona)
W74-06455

2D. Evaporation and Transpiration

DEPENDENCE OF PLANT THERMORESISTANCE ON THERMODYNAMIC PROPERTIES OF SOIL MOISTURE, (IN RUSSIAN),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 3F.
W74-06244

SIMULATION OF POST-IRRIGATION MOISTURE MOVEMENT,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W74-06335

2E. Streamflow and Runoff

MODEL AND PROTOTYPE ANALYSIS OF THE OLD RIVER DIVERSION ON THE MISSISSIPPI RIVER,
Army Engineer District. Vicksburg, Miss. Potamology Section.
For primary bibliographic entry see Field 8B.
W74-05961

FLOOD OF JULY 17, 1972 IN GALLUP, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
L. A. Waite.
Available from NTIS, Springfield, Va 22151 as PB-225 031/4As, Price $3.00 printed copy; $1.45 microfiche. Water-Resources Investigations 43-73, October 1973. 8 p, 2 fig, 2 ref.

Descriptors: *Floods, *Hydrologic data, *New Mexico, Disasters, Water levels, Stage-discharge relations.
Identifiers: Gallup(N Mex).

On July 17, 1972 severe flooding occurred in Gallup, N. Mex. An isolated storm approximately 9 miles east of Gallup covering 20 of the 558 square miles drained by the Puerco River was responsible. Floodwaters reached a peak gage height of 15.3 feet and peak discharge of 12,000 cubic feet per second at the crest-stage gage located on the Puerco River in Gallup. Peak discharge was 1.8 times a 50-year flood. Floodwaters damaged 120 residences, 48 businesses, and 11 public buildings and facilities. Total damages were estimated at $1,293,000. (Knapp-USGS)
W74-06267

MAGNITUDE AND FREQUENCY OF FLOODS IN ILLINOIS,
Geological Survey, Champaign, Ill.
J. M. Carns.
Illinois Division of Water Resource Management Publication, 1973. 599 p, 7 fig, 12 tab, 11 ref.

Descriptors: *Floods, *Illinois, Discharge(Water), *Hydrologic data, *Data collections, Peak discharge, *Flood frequency, Flood recurrence interval, Stage-discharge relations.

Flood-peak data and methods of estimating the magnitude and frequency of floods for most streams in Illinois are presented. Flood-frequency curves are given for gaged sites where 10 or more years of flood records have been collected. Flood characteristics from these curves were related, by multiple-regression analysis, to drainage basin characteristics. Regional equations are presented which relate flood-peak discharges to recurrence intervals of 1.25, 2, 5, 10, 25, 50 and 100 years using drainage area, main-channel slope, rainfall intensity, and a regional factor as independent variables. These equations can be used to estimate the magnitude and frequency of floods at most ungaged sites where flood discharges are not significantly affected by regulation or urbanization. Graphs are presented for estimating flood magnitudes on some streams where the regional equations are not applicable. A compilation is included of peak stages and discharges at gaging stations having 5 or more years of record. Where available, all floods above a selected base are included in the tabulations. Only the annual maximum floods are shown for other stations. (Knapp-USGS)
W74-06271

INDEX OF SURFACE WATER STATIONS IN TEXAS, OCTOBER 1973.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W74-06279

KILLER FROM THE BOTTOM OF THE SEA,
For primary bibliographic entry see Field 4A.
W74-06286

NUMERICAL SIMULATION OF TSUNAMIS,
Hawaii Inst. of Geophysics, Honolulu.
For primary bibliographic entry see Field 4A.
W74-06297

FLOOD OF SEPTEMBER 3, 1972, IN HILLSBORO, NEW MEXICO,
Geological Survey, Albuquerque, N. Mex.
L. A. Waite.
Open-file report, October 1973. 19 p, 2 fig, 5 ref.

Descriptors: *Floods, *New Mexico, Peak discharge, Disasters, Storm runoff.
Identifiers: *Hillsboro(N Mex).

A flood struck the village of Hillsboro, N. Mex., during the early morning hours of September 3, 1972. Hillsboro is situated at the confluence of Percha Creek and its main tributary, North Percha Creek. Heavy rainfall in the drainage basin upstream from Hillsboro occurred during the night of September 2-3. Peak discharge computed by slope-area measurements indicated that Percha Creek carried a maximum flow of 346 cubic meters per second and that North Percha Creek carried a flow of 592 cu m per second at points just upstream from Hillsboro. Levees on the south bank of Percha Creek failed and floodwaters reached depths of 1.8 meters in Hillsboro. (Knapp-USGS)
W74-06299

EFFECTS OF A GENETIC SOIL GROUP ON RUNOFF (VLIYANIYE GENETICHESKOGO TIPA POCHVY NA STOK),
For primary bibliographic entry see Field 2G.
W74-06304

ASYNCHRONOUS LONG-PERIOD STREAMFLOW FLUCTUATIONS IN THE EUROPEAN USSR (ASINKHRONNOST' MNOGOLETNIKH KOLEBANIY STOKA REK YEVROPEYSKOY TERRITORII SSSR),
N. P. Smirnov.
Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva, Vol 104, No 1, p 59-63, January-February 1972. 2 fig, 2 tab, 5 ref.

Descriptors: *Streamflow, *Fluctuations, *Statistical methods, Correlation analysis, Runoff, Discharge(Water), Gaging stations, Mapping.
Identifiers: *USSR(European region).

To study asynchronous long-period fluctuations of streamflow in the European part of the USSR, data were selected on average annual discharges at 19 gaging stations for 1915-64. Streamflow fluctuations in European Russia are generally relatively inhomogeneous. Long-period streamflow fluctuations are characterized by both a zonal and meridional asynchronism. Estimate of the expansion of fields of average annual streamflow for the first six terms of the expansion, and coefficients of correlation between coefficients of the expansion of average annual runoff and discharges at individual gaging stations are tabulated. Fields of the first three eigenvectors of expansion of average annual streamflow are mapped. Use of the method of expansion into natural orthogonal functions for investigation of long-period streamflow fluctuations makes it possible to divide an area into zones on the basis of the character of these fluctuations. (Josefson-USGS)
W74-06305

FLOOD OF SEPTEMBER 1971 IN SOUTHEASTERN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
L. V. Page, and L. C. Shaw.
Open-file report, 1973. 33 p, 13 fig, 3 tab.

Descriptors: *Floods, *Storm runoff, *Urban runoff, *Pennsylvania, Peak discharge, Disasters.
Identifiers: *Delaware River Basin(Pa).

Record-breaking floods on Sept. 13, 1971, occurred in some urbanized basins of southeastern Pennsylvania. This flooding resulted from heavy, intermittent thunderstorms on Sept. 11-13, 1971, which produced 8 to 12 inches of rainfall in the basins of Skippack, Stony, and Chester Creeks. Rain was heaviest during midday of the 13th. The Chester and Norristown areas were declared Flood Disaster Areas by the Federal and State Governments. Peak stages and discharges are given for 25 gaging stations and 4 miscellaneous sites. Flood profiles are shown for Chester Creek, West Branch Chester Creek, and Stony Creek. (Knapp-USGS)
W74-06354

THE WATER-STAGES AT THE COASTS OF SWEDEN, 1970.
Swedish Meteorological and Hydrological Inst., Stockholm.
Sveriges Meteorologiska och Hydrologiska Institut, Vol 52, No 3.2, 1970. 28 p.

Descriptors: *Data collections, *Tides, *Water level fluctuations.
Identifiers: *Sweden.

Water level tables contain a summary of the 1970 measurements at Swedish tide gage stations. The maximum, minimum and mean values of the waterstages are determined from 24 momentary values with an interval of one hour from 0 h to 23 h G.M.T. (Knapp-USGS)
W74-06373

PHYSICAL OCEANOGRAPHY OF THE NORTHERN GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W74-06427

THE LAND HYDROLOGY OF THE SOUTH-CENTRAL COASTAL ZONE,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 2L.
W74-06433

HYDROLOGY: PART II--SURFACE HYDROLOGY AND GEOMORPHOLOGY,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
For primary bibliographic entry see Field 3B.
W74-06447

INFLOW OF RIVER WATERS TO THE BALTIC SEA FROM THE USSR (PRITOK RECHNYKH VOD V BALTIYSKOYE MORE S TERRITORII SSSR),
T. Ye. Grigorkina.

Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva, Vol 104, No 2, p 130-134, March-April 1972. 2 fig, 3 tab, 6 ref.

Descriptors: *Inflow, *Rivers, *Runoff, Runoff coefficient, Watersheds(Basins), River basins, Discharge(Water).
Identifiers: *USSR(Baltic Sea).

Runoff of rivers draining into the Baltic Sea from the Soviet Union was calculated on the basis of recent hydrometric data. The length of record at outlet gaging stations of major rivers ranges from 23 years for the Luga River at Kingisepp to 156 years for the Neman River at Smalininkai. The highest rate of runoff is observed in the Parnu and Salaca River basins (9.28 liters/sec/sq km) and the smallest in the Pregel River basin (6.34 liters/sec/sq km). Average long-period runoff of Soviet rivers into the Baltic Sea is 160 cu km/yr. (Josefson-USGS)
W74-06448

2F. Groundwater

HYSTERETIC WATER FLOW IN A POROUS MEDIUM: EXPERIMENTAL STUDY AND NUMERICAL SIMULATION,
Illinois Univ., Urbana. Dept. of Agronomy.
R. W. Gillham.
Ph D Thesis, 1973. 91 p, 31 fig, 27 ref, append. OWRR A-014-COLO (1), 14-31-0001-3806.

Descriptors: *Simulation analysis, *Numerical analysis, *Hysteresis, *Soil water movement, Wetting, Drying, Groundwater movement, *Porous media, *Unsaturated flow, Saturated flow, Drainage.

The differential equation describing the flow of the solution phase in a partially saturated porous medium can be solved numerically to predict the time and spatial distributions of water content and pressure head which would result from imposed initial and boundary conditions. Most porous media have a highly hysteretic water content-pressure head relationship, and since natural boundary conditions induce hysteretic flow systems, hysteresis should be accounted for in solutions of the flow equation. Good agreement found between the predicted and measured values for the slow drainage-rewet experiment indicated that under the conditions of this experiment the unsaturated flow equation is an adequate description of the flow process. The numerical solution used was an adequate solution of the flow equation for a nonuniform medium. The scale of the nonuniformity in the medium used was rather small. It is not necessarily true that the procedure would work equally well for a medium having zones with large textural differences. The nonhysteretic simulation of the slow drainage-rewet experiment predicted the pressure head distribution with as great an accuracy as did the hysteretic simulation. The nonhysteretic simulation resulted in large errors in the predicted water content values. The hysteretic uniform medium simulation suggested that small nonuniformities in the medium could cause significant errors in the predicted water content values. (Knapp-USGS)
W74-05959

A MULTILAYER AQUIFER MODEL OF THE OGALLALA FORMATION IN OKLAHOMA,
Oklahoma State Univ., Stillwater.
J. T. Chowning.
Available from the National Technical Information Service as PB-230 424, $6.50 in paper copy, $1.45 in microfiche. M Sc Thesis, July 1973. 56 p, 22 fig, 8 tab, 16 ref. OWRR A-038-OKLA (2).

Descriptors: *Hydrogeology, *Model studies, *Withdrawal, Mathematical models, Hydraulic models, *Oklahoma, Water yield, Drawdown, Aquifer testing, *Aquifer characteristics.
Identifiers: *Ogallala aquifer(Okla).

The effects of layering on an aquifer were studied to obtain a better definition of the properties of the Ogallala Formation in the panhandle of Oklahoma. Two sand models simulated the conditions found in this area. Laboratory analysis of sand samples from the area were used to give an initial definition of the materials used in the model study. The validity of using a layered approach as opposed to a homogeneous approach in a computer modeling of the aquifer is supported by some of the data obtained. Transmissibilities of layers in combinations are approximated by a summation of the layer transmissibilities. Dewatering of the formation may be represented by holding the permeability of each layer constant and allowing the transmissibility to change as the formation is dewatered. The average of the specific yield values from the gravity drainage test was 0.13. (Knapp-USGS)
W74-05962

GEOPHYSICAL INVESTIGATIONS OF WASHINGTON'S GROUND WATER RESOURCES,
Washington State Univ., Pullman. Coll. of Engineering.
B. A. Siems, J. W. Crosby, J. V. Anderson, III, J. H. Bush, and T. L. Weber.
Washington Department of Ecology Technical Report 73-034 (R.P. 1221), July 1973. 59 p, 22 fig, 2 tab, 23 ref, append.

Descriptors: *Borehole geophysics, *Hydrogeology, *Stratigraphy, *Washington, Data collections, *Hydrologic data, Data processing, Data storage and retrieval, Electrical well logging, Radioactive well logging.
Identifiers: *Columbia plateau(Wash).

Since 1967 the Geohydrology Section at Washington State University has acquired geophysical log data from irrigation wells on the Columbia Plateau. A nearly complete listing of wells logged by county and legal description is given. The oldest log suites contain only natural gamma, spontaneous potential, wall rock resistivity, caliper, and neutron-neutron logs. In more recent work the following additional logs have been collected: temperature, fluid resistivity, neutron-gamma, and gamma-gamma logs. Most available log suites will contain nearly all of the logs, because the largest volume of data is recent. Vertical flowmeter logs were collected intermittently from about January 1972 to early 1973: since that time most suites have flowmeter data. Stratigraphic features from various areas are discussed in the section on stratigraphy. Selected wells are used to indicate those features recognized as locally or regionally significant. The routine availability of data in digitized form presents new opportunities for enhancing interpretation of geophysical borehole information. This increases the potential for quantitative evaluation of parameters such as porosity, density, moisture content, and gamma photon emission. Other opportunities exist for the formulation of various hybrid logs which may be useful in analyzing basalt stratigraphy. (Knapp-USGS)
W74-06262

GEOLOGY AND WATER RESOURCES OF EASTERN PART OF JUDITH BASIN, MONTANA,
Geological Survey, Billings, Mont.
R. D. Feltis.
Montana Bureau of Mines and Geology Bulletin 87, 1973. 51 p, 17 fig, 3 plate, 15 tab, 35 ref.

Descriptors: *Hydrogeology, Water resources, *Montana, *Data collections, *Hydrologic data, Surface waters, Groundwater, Water supply, Streamflow, Springs, Water yield, Limestones, Karst hydrology, Water utilization.
Identifiers: Judith Basin(Mont).

Nearly all water in eastern Judith Basin, Montana, originates from precipitation on the drainage basin. Annual precipitation ranges from about 13 inches in the basin interior to 39 inches in the mountains. In much of the area the aquifers are artesian, and some supply water for domestic and stock use. Some aquifers are potential sources of water for irrigation and industry. Most wells discharge less than 10 gallons per minute. Warm Spring and Big Springs, two first-magnitude springs, discharge mostly from limestone in the Madison Group; during the 1968 water year the springs discharged 106,000 and 90,000 acre-feet of water respectively. Precipitation and runoff recharge the cavernous limestone of the Madison Group. Comparison of the total precipitation on the Madison Group and on areas that yield runoff to the Madison and the discharge of the two first-magnitude springs shows that about 58 percent of the precipitation recharges the aquifer. A seepage run in Rock Creek in the Big Snowy Mountains showed that as much as 53 cubic feet per second infiltrates into the limestone from the creek. The total streamflow of the major perennial streams in eastern Judith Basin during the 1968 water year was 3000,000 acre-feet. This probably represents above-average runoff because 1967 and 1968 were periods of above-average precipitation. Water from most aquifers is hard but it is generally suitable for domestic and stock use. Water from the sandstone aquifers may contain undesirable amounts of iron, and corrosion of well casings is a problem in some wells producing water from the Swift Formation. (Knapp-USGS)
W74-06263

APPRAISAL OF THE QUALITY OF GROUND WATER IN THE HELENA VALLEY, MONTANA,
Geological Survey, Helena, Mont.
K. R. Wilke, and D. L. Coffin.
Available from NTIS, Springfield, Va 22151 as PB-224 563/As, Price $4.50 printed copy; $1.45 microfiche. Water-Resources Investigations 32-73, September 1973. 31 p, 2 fig, 4 tab, 12 ref.

Descriptors: *Water quality, *Groundwater, *Water pollution sources, *Montana, Nitrates, Chlorides, Hydrogeology, Coliforms, Trace elements, Septic tanks, Nutrients.
Identifiers: *Helena Valley(Mont).

Analyses of groundwater samples from the Helena valley in west-central Montana show that nitrate concentrations ranged from less than 0.1 to 6.3 mg/liter and that the median value was 0.9 mg/liter. Chloride concentrations ranged from 1.4 to 120 mg/liter, and the median value was 8.4 mg/liter. The sources of nitrate are in the valley, and areas of high nitrate concentrations coincide with areas of dense population. Results of bacteriological analyses of 65 samples of groundwater indicate that coliform bacteria were absent. Ten water samples analyzed for trace element content had a few moderately high concentrations of arsenic, copper, lead, and zinc. Groundwater in the Helena valley is a good quality and mostly a calcium bicarbonate type. Despite locally high dissolved-solids content, the water is suitable for drinking, according to U. S. Public Health Service standards. (Knapp-USGS)
W74-06269

INVESTIGATIONS--GEOLOGY AND GROUNDWATER RESOURCES, VICINITY OF CASTLE ROCK, COWLITZ COUNTY, WASHINGTON,
Washington State Dept. of Ecology, Olympia. Office of Technical Services.
For primary bibliographic entry see Field 4B.
W74-06278

OBSERVED CHANGES IN GROUNDWATER REGIME CAUSED BY THE CREATION OF LAKE DIEFENBAKER, SASKATCHEWAN,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
R. O. Van Everdingen.
Technical Bulletin No 59, 1972. 65 p, 6 fig, 5 tab, 7 ref, 2 append.

Descriptors: *Surface-groundwater relationships, *Reservoir leakage, *Canada, Seepage, Glacial drift, Gravels, Water level fluctuations, Piezometers, Artesian aquifers.
Identifiers: *Lake Diefenbaker(Saskatchewan).

Measurements between 1964 and 1971 of piezometric levels in 35 piezometers installed in 9 groups in a multiple aquifer system and in unconsolidated sediments in a section across the valley of the South Saskatchewan River near Riverhurst, Saskatchewan, revealed increased piezometric pressures as a result of the creation of Lake Diefenbaker. The increases in pressure, which vary with the water level in the reservoir, reflect a hydraulic connection between the aquifers and the reservoir, and not a classical loading effect. The stability of the area immediately downstream from the dam may have been adversely affected by these pressure increases. Groundwater discharge rates have been reduced significantly, and some loss of water from the reservoir appears to take place. (Knapp-USGS)
W74-06291

HYDROLOGY OF BASALT AQUIFERS AND DEPLETION OF GROUND WATER IN EAST-CENTRAL WASHINGTON,
Geological Survey, Tacoma, Wash.
J. E. Luzier, and R. J. Burt.
Washington Department of Ecology, Olympia, Water-Supply Bulletin No 33, 1974. 53 p, 25 fig, 3 plate, 3 tab, 24 ref, append.

Descriptors: *Hydrogeology, *Washington, *Withdrawal, Water yield, Water levels, *Basalts, *Aquifer characteristics, Transmissivity, Groundwater movement, Water resources development.

Groundwater available for large-scale withdrawal in east-central Washington occurs principally in a thick sequence of basalt flows known as the Columbia River Group. Permeable flow-contact zones within the sequence form the major aquifers of the region, and their slight regional dip to the southwest partly controls the general direction of groundwater movement. Groundwater in the flow-contact zones normally is confined by dense basalt of low permeability, and the heads in the basalt sequence generally decrease with increasing aquifer depth. Uncased well bores, 500-1,000 feet deep, interconnect a series of aquifers that otherwise are poorly connected hydraulically. Water from upper aquifers, used chiefly for domestic and stock supplies, drains continuously in most areas through the uncased irrigation wells into deeper aquifers having lower artesian pressures. This short-circuiting effect has contributed to the declines of water levels in upper aquifers, especially in the intensively pumped Odessa area. Pumpage from basalt aquifers increased from about 44,000 acre-feet in 1963 to about 149,000 acre-feet in 1968. Annual rates of decline, averaging about 2 feet for many years, have increased to about 3 feet during 1965-69. Conditions that have led to depletion of groundwater in basalt aquifers of the region include: (1) high rates of pumping withdrawal for consumptive use; (2) dense well spacing; (3) the small storage capacity and low vertical permeability of the basalt; (4) little recharge from precipitation; (5) leakage through uncased well bores; and (6) the presence of impermeable hydraulic boundaries. (Knapp-USGS)
W74-06311

GROUNDWATER MANAGEMENT,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
For primary bibliographic entry see Field 4B.
W74-06334

TENSIOMETER USE IN SHALLOW GROUNDWATER STUDIES,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W74-06343

ELECTRICAL ANALOG MODEL STUDY OF THE ALLUVIAL AQUIFER IN THE YABUCOA VALLEY, PUERTO RICO: PHASE 2--THE PLANNING, CONSTRUCTION AND USE OF THE MODEL,
Geological Survey of Puerto Rico, San Juan.
T. M. Robison, and R. B. Anders.
Open-file report 73-1, 1973. 22 p, 13 fig, 7 ref.

Descriptors: *Hydrogeology, *Analog models, *Puerto Rico, *Water yield, *Saline water intrusion, Drawdown, Withdrawal, Alluvium, Alluvial channels, Safe yield, Transmissivity, Storage coefficient, Recharge, Water balance.
Identifiers: *Yabucoa Valley(PR).

A three-layer electrical analog model was used to study the Yabucoa Valley alluvial aquifer in southeastern Puerto Rico. The aquifer occupies a broad, deep valley incised in granitic bedrock and extends about 1-1/2 miles under the Caribbean Sea. The average and maximum thicknesses of the aquifer are about 200 and 300 feet, respectively. Its area is about 17 square miles. The aquifer has a maximum transmissivity of about 7,000 square feet per day, a range of hydraulic conductivities of from 10 to 30 feet per day, and and a vertical anisotropy of 10,000:1. About 60 billion gallons of predominantly freshwater is stored in the landward part of the aquifer. The steady-state version of the model indicated that the aquifer has a net recharge and discharge of about 3 mgd. About 1 mgd of the discharge is to sea and to an artificial harbor. In the nonsteady-state version, approximately 12 mgd was pumped from the aquifer for 50 years. The sea was the main source of intruding seawater, whereas the artificial harbor was a lesser source. It was estimated that the first arrival of the intruding seawater at a well would occur after 40 years of pumping. Some possible locations for monitoring and interceptor wells were determined. Freshwater or air-injection wells also might be used at these sites to halt the influx of seawater. The total freshwater recharge potential of the area is estimated to be about 20 mgd. However, to attempt to develop the resource at that rate would cause drawdowns and seawater input, especially from the harbor, to become prohibitive. (Knapp-USGS)
W74-06351

CHEMISTRY OF SOME GROUND WATERS IN IGNEOUS ROCKS,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Land Improvement and Drainage.
For primary bibliographic entry see Field 2K.
W74-06371

GEOHYDROLOGY OF ATCHISON COUNTY, NORTHEASTERN KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06376

INVESTIGATIONS--GROUND WATER CONDITIONS IN THE VICINITY OF PLAZA, SPOKANE COUNTY, WASHINGTON,
Washington State Dept. of Ecology, Olympia. Office of Technical Services.
For primary bibliographic entry see Field 4B.
W74-06436

SUBSURFACE COMPONENT OF THE HYDROLOGIC BUDGET OF THE CASPIAN SEA (O PODZEMNOY SOSTAVLYAYUSHCHEY VODNOGO BALANSA KASPIYSKOGO MORYA),
I. S. Zektser, and A. V. Meskheteli.
Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva, Vol 104, No 2, p 88-94, March-April 1972. 27 ref.

Descriptors: *Hydrologic budget, *Groundwater, *Base flow, Water balance, Inflow, Discharge(Water), Water temperature, Winds.
Identifiers: *USSR(Caspian Sea).

Views on origin of the negative temperature anomaly off the eastern shore of the Middle Caspian vary as do estimates of groundwater runoff into the Caspian and of its role in the hydrologic budget of the sea. Values of groundwater runoff into the sea differ by a factor of more than 150, ranging from 0.3 cu km/yr to 49.3 cu km/yr. Basic directions are indicated for studying groundwater runoff into the sea to solve a number of important theoretical and practical problems. (Josefson-USGS)
W74-06449

2G. Water In Soils

HYSTERETIC WATER FLOW IN A POROUS MEDIUM: EXPERIMENTAL STUDY AND NUMERICAL SIMULATION,
Illinois Univ., Urbana. Dept. of Agronomy.
For primary bibliographic entry see Field 2F.
W74-05959

THE PHYSICAL PROCESSES IN THE SOIL AS RELATED TO SEWAGE SLUDGE APPLICATION,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 5D.
W74-05970

PHYSICAL CHANGES TO SOILS USED FOR LAND APPLICATION OF MUNICIPAL WASTE--WHAT DO WE KNOW, WHAT DO WE NEED TO KNOW,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 5D.
W74-05971

SOIL MICROBIOLOGICAL ASPECTS OF RECYCLING SEWAGE SLUDGES AND WASTE EFFLUENTS ON LAND,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 5D.
W74-05972

INORGANIC REACTIONS OF SEWAGE WASTES WITH SOILS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-05973

LAND RESOURCES,
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-05976

DETERMINATION OF AMETRINE AND ATRAZINE RESIDUES IN SOIL BY THIN-LAYER CHROMATOGRAPHY,
Serbian Inst. of Public Health, Belgrade (Yugoslavia). Dept. of Sanitary Chemistry.
For primary bibliographic entry see Field 5A.
W74-06024

CONSUMPTION OF WATER BY THE COTTON PLANT AT DIFFERENT CONCENTRATIONS OF SOIL SOLUTION, (IN RUSSIAN),
For primary bibliographic entry see Field 3C.
W74-06236

STEADY-STATE PATTERNS OF RAINWATER SEEPING THROUGH BEDDED SOIL WITH AND WITHOUT TILE DRAINS,
Iowa State Univ., Ames. Dept. of Agronomy.

N. L. Powell.
Available from the National Technical Information Service as PB-230 949 $1.45 in paper copy, $1.45 in microfiche. Ph D Thesis, 1973. 191 p, 26 fig, 6 tab, 38 ref, 3 append. OWRR A-044-IA (2).

Descriptors: *Soil water movement, *Saturated flow, *Drainage water, Mathematical models, Hydraulic models, *Tile drains, Infiltration, Laplaces equation, Excess water(Soils), *Seepage.

A modified Gram-Schmidt method was used to obtain the mathematical solution for two boundary value problems of soil water drainage. The flow medium was assumed to be water saturated. Only the steady-state condition was considered. In the first problem the seepage patterns of rainwater flowing through soil were determined. The soil is underlain by an impermeable barrier at a finite depth. A tile drain is half embedded in the impermeable barrier and located directly below furrows in the surface. In the second problem the seepage patterns of rainwater flowing through soil of infinite depth are determined. Water is allowed to stand in the drainage furrows. The solutions were obtained from potential theory by solving Laplace's equation to satisfy an appropriate set of boundary conditions. For the tile drain problem, between 16% and 100% of the minimum rainfall needed to keep the flow medium saturated passes through the flow medium to the tile drain. In some cases the water which enters the soil at the surface flows to the tile drain and does not resurface downslope. In other cases water enters the soil upslope and resurfaces again downslope. For the soil of infinite depth with no tiles, as little as 13% of the minimum rainfall passes through the flow region for a constant slope soil surface, and as high as 77% of the minimum rainfall passes through the flow region for an elliptic-shaped soil surface. Water enters the soil upslope above a critical point and after flowing through the soil resurfaces again downslope and adds to surface runoff. Photographic sequence pictures illustrate the development of streamlines in plexiglas laboratory models filled with sand. There is good agreement between the laboratory models and the mathematical analysis. (Knapp-USGS)
W74-06257

LOSS OF MERCURY(II) FROM SOLUTION,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-06266

GROWTH AND MOISTURE AVAILABILITY OF SHELTERBELTS IN THE KULUNDA STEPPE (ROST I VLAGOOBESPECHENNOST' LESNYKH POLOS V KULUNDINSKOY STEPI),
O. S. Popova, L. A. Il'inykh, and V. P. Popov.
Pochvovedeniye, No 3, p 91-96, March 1973. 1 fig, 5 tab, 4 ref.

Descriptors: *Moisture availability, *Soil moisture, *Shelterbelts, *Trees, *Grasslands, Chestnut soils, Soil physical properties, Soil texture, Moisture content, Moisture uptake, Groundwater, Precipitation(Atmospheric), Evaporation, Seasonal.
Identifiers: *USSR(Kulunda Steppe).

Growth of balsam poplar, European white birch, and elm in narrow shelterbelts on Chestnut soils in the Kulunda Steppe in 1965-71 was investigated as a function of soil moisture content. Principal sources of water supply to trees in the steppe where groundwater occurs at great depths (8-10 m) are soil water accumulated during autumn and spring and precipitation occurring during the growing season. Practices designed to increase water supply to trees, such as deep plowing or trenching, planting of windbreaks for snow retention, and loosening of soil in spaces between rows of trees, are necessary to improve the water regime of shelterbelts. (Josefson-USGS)
W74-06301

LEACHING OF SALINE SOILS WITH DIFFERENT TYPES OF DRAINAGE (PROMYVKA ZASOLENNYKH POCHV PRI RAZLICHNYKH VIDAKH DRENAZHA),
M. M. El'Mansi.
Pochvovedeniye, No 3, p 79-85, March 1973. 2 fig, 2 tab.

Descriptors: *Land reclamation, *Drainage practices, *Leaching, *Saline soils, Salinity, Salts, Drains, Curves.
Identifiers: *USSR(Golodnaya Steppe).

Leaching of saline soils was studied at the 'Yangiyer' Sovkhoz in the Golodnaya Steppe (Uzbek SSR) in 1968. Leaching was performed over an area of about 100 ha. Data on estimates of effectiveness of different types of drainage during soil desalinization are analyzed, and optimal conditions for operation of drainage installations to achieve maximum effects from leaching are determined. Strongly saline soils in the 'Yangiyer' area can be reclaimed in 1 to 3 years using permanent deep closed drains (3.0-3.5 m deep, spaced 250 m apart) and temporary deep open drains (2.0-2.5 m deep, spaced 250 m apart) at an average leaching rate of about 50,000 cu m/ha. Results of studies were confirmed by large-scale leachings at the 'Yangiyer' Sovkhoz in 1969 and can be successfully used in reclaiming saline soils common to desert and semidesert regions of Asia and North Africa. (Josefson-USGS)
W74-06302

SPATIAL VARIATION PATTERNS OF MOISTURE CONTENT OF IRRIGATED SOIL UNDER COTTON (ZAKONOMERNOSTI PROSTRANSTVENNOY IZMENCHIVOSTI VLAZHNOSTI OROSHAYEMOY POCHVY POD KHLOPCHATNIKOM),
Sredneaziatskii Gosudarstvennyi Institut po Proektirovaniyu Irrigatsionnykh Sooruzhenii i Selskikh Elektrostantsii, Tashkent (USSR).
L. N. Poberezhskiy.
Pochvovedeniye, No 3, p 50-59, March 1973. 1 fig, 5 tab, 8 ref.

Descriptors: *Soil physics, *Soil moisture, *Irrigated land, *Cotton, Variability, Irrigation practices, Groundwater, Wells, Correlation analysis, Equations.
Identifiers: *USSR(Golodnaya Steppe), *USSR(Karshi Steppe).

Soil moisture measurements were carried out in a dense network of wells in the Golodnaya and Karshi Steppes in 1967-70. The depth of groundwater occurrence on two test plots in the Golodnaya Steppe is 3-4 m, and that on one test plot in the Karshi Steppe is about 1 m. Soil moisture was determined by the neutron method in all wells at the end of each 10-day period or month and before and after irrigation of cotton during the growing season. Spatial variability of moisture content of irrigated soil under cotton is determined primarily by irrigation and depth of groundwater occurrence. At a groundwater depth of 3-4 m and in the absence of irrigation, soil moisture variability during the nongrowing season is substantially smaller than during the growing season, and in both cases decreases with depth. Use of moisture correlation functions makes it possible to estimate the degree of synchronous change and the error of extrapolation of moisture content in soil layers of different thickness and to determine the optimal number of evenly spaced wells for estimation of average soil moisture content. Principal factors affecting areal distribution of soil moisture are analyzed, and the method of computation of moisture correlation functions is described. (Josefson-USGS)
W74-06303

EFFECTS OF A GENETIC SOIL GROUP ON RUNOFF (VLIYANIYE GENETICHESKOGO TIPA POCHVY NA STOK),
G. V. Nazarov.
Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva, Vol 104, No 1, p 11-16, January-February 1972. 1 fig, 2 tab, 13 ref.

Descriptors: *Runoff, *Soil groups, *Chernozems, *Chestnut soils, *Podzols, Forest soils, Surface runoff, Overland flow, Snowmelt, Water equivalent, Permeability, Sprinkler irrigation.
Identifiers: *USSR(Kursk region).

The hydrologic importance of soil is determined mainly by its permeability and water-holding capacity. Permeability and other soil hydrophysical properties obey the law of zonality. Data are presented on sprinkler irrigation of recently plowed clay loam Podzolic soils, Typical Chernozems, and Chestnut soils. Typical Chernozems have the highest permeability and Ordinary and Leached Chernozems, a slightly lower permeability. Soil cover also plays an important role in surface runoff in spring. Comparative data on spring flow over Gray Forest soils and Typical Chernozems in the vicinity of Kursk show that Typical Chernozems in a frozen state have a higher permeability than Gray Forest soils. Surface runoff observed on Typical Chernozems was generally less. Higher surface runoff on Chernozems in the spring of 1965 was associated with a much higher water equivalent of snow. The effects of a genetic soil group on surface runoff are significant. (Josefson-USGS)
W74-06304

CONTRIBUTION TO THE STUDY OF THE ACTION OF WATER-SOLUBLE AND CITRATE-SOLUBLE PHOSPHORIC UNDER ACIDS DIFFERENT MOISTURE CONDITIONS, (IN SERBO-CROATION),
Institute for Soil Research, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 3C.
W74-06315

SIMULATION OF POST-IRRIGATION MOISTURE MOVEMENT,
Auburn Univ., Ala. Dept. of Civil Engineering.
F. J. Molz.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR4, p 523-532, December, 1972. 9 fig, 1 tab, 12 ref.

Descriptors: *Irrigation, *Soil-water-plant relationships, *Soil water movement, Drainage, Soil water, *Root zone, Darcey's law, Mathematical models, Computer models, Root systems, *Transpiration, Water loss.

Transpiration-induced moisture removal by the plant roots is represented by a negative source term in the Darcy equation. When soil is wetted to near saturation, moisture flow is initially downward due to gravity. As transpiration dries the upper soil layers, capillary suction reverses the Darcian flow. Upward water flux through soil has a maximum which occurs high in the root zone initially and gradually moves downward. Throughout much of time periods studied there was downward flow in portions of the soil-root system. Very little water, if any, was obtained by the plants from below the root zone, but considerable moisture was often lost to this region. As the soil-root system dries, a point is reached at which the Darcian moisture flux in soil can be neglected and the moisture removal process described by local extraction alone. When this occurs, the root geometry assumes major importance in determining the water supply available to a plant. (Skogerboe-Colorado State)
W74-06335

MOISTENING OF MOUNTAIN LIGHT-CHESTNUT SOILS OF EXTRACONTINENTAL REGIONS OF TIEN-SHAN AND ALTAI MOUNTAINS, (IN RUSSIAN),
Novosibirsk Inst. of Agrochemistry and Soil Science (USSR).
Zh. A. Rupasova.
Izv Sib Otd Akad Nauk SSSR Ser Biol Med Nauk. 2, p 3-7. 1972. Illus. (English summary).
Identifiers: *Chestnut soils, *Mountain regions, Soils, *USSR(Tien-Shan and Altai mts.), *Soil moisture.

These soils show extreme drying of the profile for the most part of the vegetational season and very low indices of natural moisture which is within the range of maximum hygroscopicity-wilting moisture.--Copyright 1973, Biological Abstracts, Inc.
W74-06341

LONG-TERM EFFECTS OF MANURE, FERTILIZER, AND PLOW DEPTH ON CHEMICAL PROPERTIES OF SOILS AND NUTRIENT MOVEMENT IN A MONOCULTURE CORN SYSTEM,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 5B.
W74-06346

PREFABRICATED FILTER-FIN FOR SUBSURFACE DRAINS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-06348

NITROGEN-15 ENRICHMENT OF SOILS AND SOIL-DERIVED NITRATE,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-06349

RESULTS OF THE WASHING OF SOILS OF ALEISK IRRIGATION SYSTEM BY MINERALIZED WATERS (IN RUSSIAN),
Novosibirsk Inst. of Agrochemistry and Soil Science (USSR).
For primary bibliographic entry see Field 3C.
W74-06404

EFFECTS OF A WETTING AGENT ON THE INFILTRATION CHARACTERISTICS OF A PONDEROSA PINE SOIL,
Arizona Univ., Tucson. Dept. of Watershed Management.
M. G. Kaplan, and M. J. Zwolinski.
In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the Arizona Section--American Water Resources Association and the Hydrology Section--Arizona Academy of Science, Tucson, Arizona, May 4-5, 1973, Vol 3, p 21-25 (1973). 1 fig, 6 ref.

Descriptors: *Wetting, *Infiltration rates, *Litter bulk density, *Runoff, *Ponderosa pine trees, Infiltrometers, Soil moisture, Erosion, Surfactants, Resins, Antecedent moisture content, *Arizona, Watershed management.
Identifiers: *Hydrophobic soils.

Effects of the wetting agent 'WATER-IN' on infiltration rates and runoff were investigated on some hydrophobic soils in the ponderosa pine forest type of east-central Arizona. The treatment was applied to both bare mineral soil and soil covered with ponderosa pine litter at a rate of 10 gallons per acre. Infiltration rates were measured by a modified North Fork infiltrometer. A significant increase in infiltration rate was noted on the bare mineral soil, but a notable increase in runoff was observed on the litter covered plots due to 'WATER-IN' application. Water infiltration rate increases on the bare mineral soil plots is hypothesized to be the result of a decrease in average bulk density of the surface inch of soil. Other soil physical properties investigated were unchanged by the wetting agent. An increase in runoff from the litter treated by 'WATER-IN' is thought to be the result of a hydrophobic condition which previously did not exist. (Mastic-Arizona)
W74-06456

WAX-TREATED SOILS FOR HARVESTING WATER,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 3B.
W74-06457

SOIL MOISTURE PATTERNS ON TWO CHAINED PINYON-JUNIPER SITES IN UTAH,
Utah State Univ., Logan. Coll. of Natural Resources.
G. F. Gifford, and C. B. Shaw.
Journal of Range Management, Vol 26, No 6, p 436-440, November, 1973. 6 fig, 2 tab, 3 ref.

Descriptors: *Soil moisture, *Forest management, *Pinyon pine trees, *Juniper trees, Soil profiles, Seepage, Litter, Microclimatology, Mulching, Water yield, *Utah, Soil texture, Sagebrush, Precipitation(Atmospheric), Subsurface flow.
Identifiers: *Chaining, Windrowing, Woodlands, Moisture flux.

Differences in soil moisture patterns were studied under sites that were chained-with-debris-windrowed, and a natural pinyon-juniper woodland. Soil moisture accumulation was greatest under sites with debris-in-place, and the least under natural woodlands. Soil moisture pattern differences are the result of microclimatic changes due to chaining, mulching effect of litter from the debris-in-place treatment, different rooting depths, length of growing season, and snow accumulation differences. Vegetation density variability on the chained sites did not affect soil moisture patterns. There was no evidence of deep seepage on any treated sites. (Mastic-Arizona)
W74-06459

WATER HARVESTING EFFICIENCIES OF FOUR SOIL SURFACE TREATMENTS,
Agricultural Research Service, Laramie, Wyo.
For primary bibliographic entry see Field 3B.
W74-06463

COASTAL DESERTS OF THE OLD WORLD AND THEIR RECLAMATION,
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
For primary bibliographic entry see Field 4A.
W74-06479

FERRUGINOUS CONCRETIONS IN A POORLY DRAINED SOIL OF ALBERTA,
Alberta Univ., Edmonton.
S. Pawluk, and J. Dumanski.
Soil Sci Soc Am Proc. Vol 37, No 1, p 124-127, 1973. Illus.
Identifiers: Albaqualf, *Canada(Peace River), *Concretions(Ferruginous), *Iron oxides, Sideric, X-Ray, Drainage, Minerals, Maghemite, Acid shales, *Soils(Magnetic properties).

Investigations into the nature of a poorly-drained soil pedon developed from acid shales in the Peace River region of Alberta, Canada, revealed the presence of ferruginous concretions in the A and B horizons. Concretions from both horizons were separated into 2 groups, magnetic and nonmagnetic. Magnetic properties were attributed to the presence of maghemite. This mineral was associated with iron oxides amorphous to X-rays in the A horizon and with hematite in the B horizon. Iron oxide in nonmagnetic concretions from the A horizon was X-ray amorphous while that in the B was crystallized as both goethite and hematite. Magnetic concretions from the A horizon showed dense areas when viewed in thin-sections and contained less organic matter and oxalate extractable iron than the associated nonmagnetic concretions. An authigenic origin is suggested for the concretions.--Copyright 1973, Biological Abstracts, Inc.
W74-06485

APPLICATION OF MULTISPECTRAL REMOTE SENSING TO SOIL SURVEY RESEARCH IN SOUTHEASTERN PENNSYLVANIA,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W74-06494

2H. Lakes

TRANSFER OF HEAVY METAL POLLUTANTS FROM LAKE ERIE BOTTOM SEDIMENTS TO THE OVERLYING WATER,
Bowling Green State Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W74-05956

LAKE ERIE, OHIO, PENNSYLVANIA, NEW YORK INTAKE WATER QUALITY SUMMARY, 1970,
Environmental Protection Agency, Chicago, Ill. Region V.
For primary bibliographic entry see Field 5B.
W74-05987

REPRODUCTIVE CHARACTERISTICS OF THE CUI-UI LAKESUCKER (CHASMISTES CUJUS COPE) AND ITS SPAWNING BEHAVIOR IN PYRAMID LAKE, NEVADA,
Nevada Univ., Reno. Dept. of Biology.
D. L. Koch.
Trans Am Fish Soc. Vol 102, No 1, p 145-149. 1973.
Identifiers: Behavior, Chasmistes-cujus, *Cui-ui lakesucker, Eggs, Lakes, *Nevada(Pyramid Lake), Parasitism, Saprolegnia, *Spawning, *Reproduction(Lakesucker).

Pyramid Lake, Nevada, provides suitable habitat for adult cui-ui, but becomes limiting for the development and hatching of the eggs. The continued diversions of the Truckee River have eliminated access to ancestral spawning areas by the cui-ui. The diversions of the river have also caused a decline in the level of Pyramid Lake which is becoming more limiting to the cui-ui as ion concentrations increase. During 1971, cui-ui were observed spawning in Pyramid Lake for the first time. Cui-ui males and females can be easily distinguished in the breeding condition. The males are smaller than the females and are densely covered with pearl organs. The females are more robust than the males and do not exhibit a pinkish lateral stripe present on the males. The spawning sites are in clear, cool waters and have bottom gravel fine to coarse in texture. These sites are located near tributary streams where bottom gravels are clean. One female is attended by 2-6 males during the spawning act, and she spawns 4-5 times before returning to deep water. Cui-ui spawning is marginal at best in Pyramid Lake due to heavy predation by cui-chubs on the fertilized eggs and parasitism on the eggs by the fungus Saprolegnia sp. Thus, efforts should and are being made to artificially propagate this species before its ultimate extinction under present conditions.--Copyright 1973, Biological Abstracts, Inc.
W74-05999

ALGAL ASSAYS OF ARCHIPELAGO WATERS. QUANTITATIVE ASPECTS,
Lantbrukshogskolan, Uppsala (Sweden). Institutionen for Vaxtfysiologi.
For primary bibliographic entry see Field 5C.
W74-06015

THE BIOLOGY OF MYSIDS ACCLIMATIZED IN THE RESERVOIRS OF THE VOLGA RIVER,
Akademiya Nauk SSSR, Tolyatti. Institut Biologii Vnutrennykh Vod.
N. D. Borodich, and F. K. Havlena.
Hydrobiologia, Vol 42, No 4, p 527-539, September 28, 1973. 4 fig, 5 tab, 20 ref.

Descriptors: *Systematics, Habitats, Environment, Reservoirs, Light intensity, Migration, Reproduction, Behavior, Adaptation, Distribution patterns, *Shrimp, *Crustaceans.
Identifiers: *Mysids, *Opossium shrimp, Macroinvertebrates, *USSR(Volga River).

Mysides were successfully introduced and acclimatized in the artificial reservoirs of the Volga River. They live there in the shallow sandy areas and their numbers amount to 300-500 ind/sq m. They avoid direct sunlight, make slight vertical migrations according to the light intensity; during the morning hours their maximum is at the depth 0.2 m, at noon in 0.1-1.5 m. It has been proved that their biological features in the new localities do not differ from those in the original localities. (Mortland-Battelle)
W74-06017

EFFECTS OF ARTIFICIAL HYPOLIMNION AERATION AND RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON) DEPTH DISTRIBUTION,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 5C.
W74-06041

INDICATIONS OF DISTURBANCES IN THE NITRIFICATION PROCESS IN A HEAVILY NITROGEN-POLLUTED WATER BODY,
Swedish Water and Air Pollution Research Lab., Stockholm.
For primary bibliographic entry see Field 5C.
W74-06044

THE DISTRIBUTION OF ASELLUS AQUATICUS (L.) AND PROASELLUS MERIDIANUS (RAC.) IN THE SOUTHWESTERN PART OF THE NETHERLANDS,
Delta Inst. for Hydrobiologycal Studies, Yerseke (Netherlands).
For primary bibliographic entry see Field 5C.
W74-06051

DIVERSITY IN FRESH-WATER PHYTOPLANKTON,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 5C.
W74-06057

PLANKTON PIGMENT HETEROGENEITY IN SEVEN RESERVOIRS OF THE LOWER COLORADO BASIN,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 5C.
W74-06078

ENRICHING EFFECTS OF URBAN RUNOFF ON THE PRODUCTIVITY OF A MESOTROPHIC LAKE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W74-06080

SOME CHARACTERISTICS OF AN OSCILLATORIA-DOMINATED METALIMNETIC PHYTOPLANKTON COMMUNITY,
Allegheny Coll., Meadville, Pa. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-06081

DIEL AND ANNUAL CYCLES OF NET PLANKTON PHOTOSYNTHESIS IN LAKE ONTARIO,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-06083

A PRELIMINARY NOTE ON THE SEQUENTIAL DECOMPOSITION OF PECTIN BY AQUATIC BACTERIA,
Freiburg Univ. (West Germany). Limnologisches Institut.
For primary bibliographic entry see Field 5B.
W74-06092

VERTICAL DISTRIBUTION OF TRANSPARENCY IN LAKE BAIKAL AND ITS RELATIONSHIP TO BIOLOGICAL INDICES, (IN GERMAN),
P. P. Sherstyankin, V. M. Kaplin, and V. N. Maksimov.
Gidrobiol Zh. Vol 8, No 4, p 65-68, 1972. Illus.
Identifiers: *Lake Baikal, Biological indicies, Cyclotrichium-brunneum, Didinium-nasutum, *Distribution(Vertical), Epischura-baicalensis, Gymnodinium, Indices, Lakes, *Transparency, USSR.

Vertical changes in transparency (index of the reduction of parallel light), temperature, pH and the vertical distribution of 13 species of zoo-, phyto- and microbial plankton, including Epischura baicalensis, Didinium nasutum, Cyclotrichium brunneum and Gymnodinium were analyzed. The transparency was measured by a photometer-transparency meter in 6 regions of the spectrum from UV to red. The layer with the maximum index of transparency corresponded to that with maximum biological indices. The UV portion of the spectrum was most sensitive to different substances in the water such as dissolved organic matter and suspended particles compared to other portions. Changes in the transparency index could be used to show horizontal and vertical distribution of plankton.--Copyright 1973, Biological Abstracts, Inc.
W74-06237

PRELIMINARY RESULTS OF STUDIES ABOUT THE PLANKTON OF THE 'LAGUNA SETUBAL' (SANTA FE, ARGENTINA), (IN SPANISH),
Universidad Nacional del Litoral, Santa Fe (Argentina). Lab. of Radioisotopes.
A. Martinez De Ferrato, R. Perez Del Viso, and N. Bonnier.
Acta Zool Lilloana. 28, p 47-66, 1971. Illus. (English summary).
Identifiers: *Argentina(Laguna Setubal), *Carbon-14 techniques, Plankton, *Zooplankton, Primary production.

From March to Sept. of 1969, monthly samples were taken in 17 places of the 'laguna Setubal' in order to study the characteristics and population variations of the zooplankton, to estimate the plankton pigments and the primary production using the carbon-14 technique. Daily samples were also taken at the end of the basin during 30 consecutive days to show zooplankton fluctuations.--Copyright 1973, Biological Abstracts, Inc.
W74-06238

HYDROBIOLOGICAL INVESTIGATIONS IN DAM RESERVOIRS OF POLAND, (IN POLISH),
Jagellonian Univ., Krakow (Poland). Instytut Zoologii.
K. Starzykowa.
Przegl Zool. Vol 16, No 2, p 151-160, 1972. (English summary).
Identifiers: Animals, *Biocenoses, Dams, Formations, *Hydrobiological studies, Poland, Reservoirs.

Important problems related to formation of associations of plants and animals are studied. Conclusions of a general biological nature were drawn from changes taking place in these artificial aquatic biocenoses as the reservoirs aged. The significance of detailed investigations in dam reservoirs to man's economy was stressed.--Copyright 1973, Biological Abstracts, Inc.
W74-06242

PLANKTON OF THE 'OZERO AYATSKOYE' RESERVOIR AS FODDER BASE FOR COREGONIID FISH, (IN RUSSIAN),
I. V. Kozlova.
Gidrobiol Zh. Vol 8, No 5, p 42-51, 1972. Illus. (English summary).
Identifiers: Biomass, Consumption, *Coregoniid fish, Hydrology, *Plankton, Reservoir, *USSR(Ozero Ayatskoye reservoir), Fish foods.

The composition, number and biomass dynamics of animal plankton in the Ozero Ayatskoye, USSR, is shown, with reference to hydrological condition changes. The high importance of pH is established. Within a year (except May), the peaceful forms are dominant in the plankton (56.5-90%). The intense consumption, over a year, by planktonophagous and polyphagous (and benthophagous) fishes affected the fodder capacity of the lake, so at the end of Feb. planktonic organisms became close to extinction.--Copyright 1973, Biological Abstracts, Inc.
W74-06247

OBSERVATIONS ON WATER FLEAS (CLADOCERA) IN THE TROUT POOLS AT THE BIOLOGICAL STATION LUNZ (LOWER AUSTRIA),
Z. Stromenger.
Pol Arch Hydrobiol. Vol 19, No 3, p 291-301, 1972. Illus.
Identifiers: Alona-affinis, Alona-costata, Alona-guttata, *Austria, Biological studies, Ceriodaphnia-quadrangula, Chydorus-sphaericus, Cladocera, Scapholeberis-mucronata, Simocephalus-vetulus, *Water fleas, *Crustaceans, *Fish pools.

Observations were made in 4 subalpine shallow trout pools which were connected by dams, and contained continuously flowing cool clear water. A total 7 Cladocera species were found in the pools: Chydorus sphaericus, Simocephalus vetulus, Scapholeberis mucronata, Alona affinis, A. guttata, A. costata and Ceriodaphnia quadrangula. The first 3 were the most frequent. Species and individual count were much lower for these pools than in carp pools of the Central European lowlands. The Cladocera were particularly frequent in warm sunny positions between bank and underwater plants. C. sphaericus is most frequent in the end of Aug. and beginning of Sept. At this time numerous males and ephippial females occur.--Copyright 1973, Biological Abstracts, Inc.
W74-06248

ESTIMATING ACCURACY FOR CALCULATING PRODUCTION AND ELIMINATION OF PLANKTONIC CRUSTACEANS USING EUDIAPTOMUS GRACILIS IN LAKE KRASAVITSA AS AN EXAMPLE, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
M. B. Ivanova.
Zool Zh. Vol 52, No 1, p 111-120, 1973. Illus. (English summary).
Identifiers: *Crustaceans, Density, Eudiaptomus-gracilis, Lakes, *Planktonic populations, *USSR(Lake Krasavitsa), *Productivity.

The population of planktonic crustaceans can be considered as a stationary one if the population density of individual ages is assumed as the average year density weighed by the time of their presence in the plankton. The average diurnal production and elimination for such a stationary population can be calculated. The production of the E. gracilis population by average diurnal increases was determined, as well as the diurnal elimination both for individual ages and total by the rate of population recruitment. In the case of stationary population, all 3 methods give the same results (P = 47.16 mg/m sq/1 day at the biomass of 515.59 mg/m sq). The relative mortality proved to be constant (d = 0.0782), i.e. in the lake under study no preferential elimination of any age of E. gracilis was observed. On some examples, the diurnal production, rate of biomass accumulation and G/W-coefficients were shown to depend on the character of viability curve. Standard errors were calculated for different methods of calculation. The error was the least when calculating production by diurnal increases. To decrease the scatter of calculated production, special attention is paid to the accuracy in estimating the numbers of animals.--Copyright 1973, Biological Abstracts, Inc.
W74-06249

PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF CONEWAGO LAKE DRAINAGE BASIN, YORK COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 5C.
W74-06259

LAKES OF OREGON: VOLUME ONE, CLATSOP, COLUMBIA, AND TILLAMOOK COUNTIES,
Geological Survey, Portland, Oreg.
R. B. Sanderson, M. V. Shulters, and D. A. Curtiss.
Open-file report, 1973. 95 p, 5 fig, 19 ref.

Descriptors: *Lakes, *Oregon, *Hydrologic data, Data collections, Limnology.
Identifiers: Clatsop County(Ore), Columbia County(Ore), Tillamook County(Ore).

An inventory of lakes and reservoirs in Clatsop, Columbia, and Tillamook Counties, Oregon, is presented. In addition to office compilation of existing data, most lakes were visited at least once. Visits were made in late summer or early fall when lakes were most accessible and when water temperature and biological activity are at a maximum. (Knapp-USGS)
W74-06270

BEACH FORESHORE SEDIMENTOLOGY AND MORPHOLOGY IN THE APOSTLE ISLANDS OF NORTHERN WISCONSIN,
California State Univ., Fullerton. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W74-06281

SEDIMENTATION RATES AND RECENT SEDIMENT HISTORY OF LAKES ONTARIO, ERIE AND HURON,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
For primary bibliographic entry see Field 2J.
W74-06282

OBSERVED CHANGES IN GROUNDWATER REGIME CAUSED BY THE CREATION OF LAKE DIEFENBAKER, SASKATCHEWAN,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 2F.
W74-06291

WATER EXCHANGE IN LAKE BAYKAL (O VODOOBMENE V OZ. BAYKAL),
Institute of Geography of Siberia and the Far East, Irkutsk (USSR).
V. I. Verbolov, and M. N. Shimarayev.
Institut Geografii Sibiri i Dal'nego Vostoka Doklady, No 36, p 41-47, Irkutsk, 1972. 1 fig, 2 tab, 19 ref.

Descriptors: *Lakes, *Currents(Water), *Water circulation, *Movement, Velocity, Water balance, Inflow, Discharge(Water), Tritium, *Spatial distribution.
Identifiers: *USSR(Lake Baykal), Water exchange.

Basic characteristics of horizontal and vertical movements in Lake Baykal are examined. Estimates are made of the extent of water exchange caused by horizontal currents, and analysis of water exchange between morphologically independent parts of the basin is based on data on spatial distribution of water-balance items in the lake and of natural tritium. The time required for lake waters to be replaced by river waters is about 500 years for the northern part of the lake, 250 years for the middle part, and 90 years for the southern part. The rate of vertical circulation in the area of slopes is estimated at 0.01-0.1 cm/sec. The time required for complete exchange of surface and deep waters is about 11 years. (Josefson-USGS)
W74-06306

THE OCCURRENCE OF RHIZOCHRYSIS LIMNETICA G. M. SMITH IN THE PLANKTON OF LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
G. Tamas.
Ann Inst Biol (Tihany) Hung Acad Sci. 39 p, 149-150. 1972. Illus.
Identifiers: *Hungary(Lake Balaton), Migration, *Plankton, *Rhizochrysis-limnetica, Species migration.

R. limnetica is reported as occurring in Lake Balaton, Hungary, in the late summer and fall of 1967, 1968 and 1971; this is a new record for Europe for this species. It is suggested that the species was transported into the lake via the Berek Canal, River Zala or via the moorlands of fishponds.--Copyright 1973, Biological Abstracts, Inc.
W74-06337

CONTRIBUTIONS TO THE KNOWLEDGE ABOUT THE BIOLOGY AND ECOLOGY OF FRESHWATER OSTRACODS FROM THE NEIGHBORHOOD OF HAMBURG, (IN GERMAN),
Hamburg Univ. (West Germany). Museum of Zoology.
D. Hiller.
Arch Hydrobiol Supplement B., Vol 40, No 4, p 400-497, 1972. Illus. English summary.
Identifiers: Biology, Ecology, *Germany(Hamburg), *Ostracods(Freshwater), *Salinity, *Water temperature, *Hydrogen ion concentration, Aquatic animals, Lakes, Ponds.

For 18 mo. the ostracod fauna of 32 lakes, ponds and other waters in the neighborhood of Hamburg (West Germany) was studied. Physical and chemical analyses of all the waters were made. The biology and the periodicity of all species were examined. The relation to water temperature, salinity and pH-value was studied. All species were systematically characterized by measurements of their shells and limbs.--Copyright 1973, Biological Abstracts,Inc.
W74-06420

THE EFFECTS OF RESTRICTED CIRCULATION ON THE SALT BALANCE OF GREAT SALT LAKE, UTAH,
Geological Survey, Salt Lake City, Utah.
K. M. Waddell, and E. L. Bolke.
Utah Geological and Mineral Survey, Salt Lake City, Water-Resources Bulletin 18, December 1973. 54 p, 15 fig, 9 tab, 16 ref, append. Price: $3.00.

Descriptors: *Brines, *Lakes, *Water circulation, *Utah, *Great Salt Lake, *Computer models, Saline lakes, Evaporation, Water balance, Water quality, Mathematical models.

A digital computer model describing the brine movement through the causeway across Great Salt Lake, Utah was developed to predict the future trend of the salt balance between the two parts of the lake for the existing causeway and for modified culvert openings and various rates of inflow. During the 1970-1972 water years a net load of dissolved solids of 0.26 billion tons moved from the south to north part of Great Salt Lake through the causeway. The balance of dissolved-solids load in the lake for the existing causeway conditions depends principally upon the quantity of freshwater inflow to the lake. For simulated inflow rates resulting in rising stages, the net dissolved-solids load increased slightly in the south part during a 10-year period. If the rate of rise of lake stage is great enough, net load movement could be to the north part. If the lake stage drops at the simulated rate for a 10-year period, the net effect would be a loss of 0.27 billion tons of dissolved-solids load from the south to the north part and the deposit of 1.08 billion tons of sodium chloride in the north part. The salt balance in Great Salt Lake can be changed by increasing the number of culverts or by widening the culverts in the causeway. The width of culvert opening necessary to bring the lake near chemical equilibrium depends upon the inflow conditions and desired salt balance. A culvert width of 500 feet would be required to bring the dissolved-solids concentration in the south part to within about 85 percent of that in the north part and to limit precipitation of sodium chloride in the north part to less than 0.1 billion tons (for lake altitudes above 4,192 feet) for all the simulated inflow rates. A culvert width of 750 feet would be required to bring the dissolved-solids concentration in the south part to within about 90% of that in the north part. (Knapp-USGS)
W74-06435

WATER LILIES AS BEAVER FOOD.
Newfoundland Wildlife Service, St. John's.
T. H. Northcott.
Oikos. Vol 23, No 3, p 408-409, 1972.
Identifiers: *Beaver food, Nuphar-microphyllum, Nuphar-variegatum, *Water lilies, *Canada(Newfoundland), Ponds.

Water lily (Nuphar microphyllum, N. variegatum) roots as potential food supply for beavers were investigated in an area of central Newfoundland. The geology and topography of the pond bottom often make the lily roots inaccessible to beavers. An abundance of lilies in a pond does not necessarily imply an abundance of root food for the beaver.--Copyright 1973, Biological Abstracts, Inc.
W74-06490

SEASONAL CHANGES IN ORGANIC NITROGEN CONTENT OF NET-AND NANNOPHYTOPLANKTON IN TWO HARDWATER LAKES,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 5C.
W74-06495

NEW COMPLEXITIES IN ZOOGEOGRAPHY AND TAXONOMY OF THE PYGMY WHITEFISH (PROSOPIUM COULTERI),
Manitoba Univ., Winnipeg. Dept. of Zoology.
C. C. Lindsey, and W. G. Franzin.
J Fish Res Board Can. Vol 29, No 12, p 1772-1775. 1972. Illus.

Identifiers: *Canada(Elliott Lake), *Prosopium-coulteri, Records, Taxonomy, *Whitefish, Zoogeography, Lakes.

Pygmy whitefish (P. coulteri) are recorded for the first time from the Peel-Mackenzie river drainage (Elliott Lake, Yukon Territory) and from the Hudson Bay drainage (Waterton Lakes, Alberta, in the South Saskatchewan-Nelson river system)(Canada). The morphology of specimens from both localities contradicts the previously known pattern of a southeastern 'low-rakered' and a northwestern 'high-rakered' form (with the 2 forms occurring sympatrically in some lakes of the Bristol Bay area). Specimens from Elliott Lake, the most northerly known locality, resemble the southeastern form and those from Waterton Lakes the northwestern form. Both Waterton and Elliott lakes lie close to unglaciated refugia, suggesting that the species may have survived Wisconsin glaciation and diverged in several different watersheds.--Copyright 1973, Biological Abstracts, Inc.
W74-06498

GROWTH , LIFE HISTORY, AND RESPIRATION OF MYSIS RELICTA IN AN ARCTIC AND TEMPERATE LAKE,
Trent Univ., Peterborough (Ontario). Dept. of Biology.
D. C. Lasenby, and R. R. Langford.
J Fish Res Board Can. Vol 29, No 12, p 1701-1708. 1972. Illus.
Identifiers: *Arctic lakes, *Canada(Char Lake-N.W.T.), *Growth rates, Lakes, *Mysis-Relicta, *Respiration, Temperate lakes, Life cycle, Aquatic animals.

M. relicta from Char Lake (N.W.T.) (Canada) take 2 yr to reach maturity, retaining 36 cal as net production; those from Stony Lake (southern Ontario) (Canada) mature in 1 yr, retaining 53 cal as net production. Growth rates were highest during summer months for individuals in both lakes. Results of respiration experiments at 0, 2, 4, 6, and 8C for Char Lake mysids and at 2, 4, 7, 10, and 13C for Stony Lake mysids were not significantly different, indicating that M. relicta demonstrates no metabolic compensation over its environmental temperature range. Generalized energy budgets were constructed for individuals from each population for their entire life-span. A female uses approximately 209 cal for growth and respiration to become a reproducing adult in 1 yr in Stony Lake and approximately 206 cal to become a reproducing adult in 2 yr in Char Lake.--Copyright 1973, Biological Abstracts, Inc.
W74-06500

2I. Water In Plants

SOIL-PLANT RELATIONSHIPS (SOME PRACTICAL CONSIDERATIONS IN WASTE MANAGEMENT),
Illinois Univ., Urbana.
For primary bibliographic entry see Field 5D.
W74-05977

DIVERSITY AND LONGITUDINAL ZONATION IN FISH POPULATIONS OF TWO STREAMS ENTERING A METROPOLITAN AREA,
Toledo Univ., Ohio. Dept. of Biology.
E. J. Tramer, and P. M. Rogers.
The American Midland Naturalist, Vol 90, No 2, October 1973, p 366-374. 1 fig, 3 tab, 11 ref.

Descriptors: *Systematics, *Fish populations, *Distribution patterns, Freshwater fish, Water pollution effects, Depth, Streams, Sampling, Habitats, Carp, Catfishes, Perches, Sunfishes, Pikes, Shiners, Suckers, Correlation analysis, Fish populations, *Ohio.
Identifiers: *Data interpretation, Species diversity, Habitat diversity, Substrates.

The distribution and relative abundance of fishes were surveyed in Swan and Tenmile creeks, Lucas Co., Ohio, from their headwaters in a rural agricultural area to points near the center of the city of Toledo, Ohio. Twenty-one species were found in each creek. Of the total of 27 species collected only two, Semotilus atromaculatus and Notropis stramineus, occurred at each sample station. Species diversity along both streams followed no definite pattern, even when the creeks became grossly polluted, since declines in the number of species present were often offset by shifts toward relative abundances which were more evenly distributed. Fush species diversity was not correlated with an index of habitat diversity. Furthermore, unlike other longitudinal zonations, diversity was not correlated with mean depth of the stream or with distance from the headwaters, and species composition changes took the form of replacements rather than additions to the headwaters assemblage. Pollution stress cancelled out the effects of factors such as substrate diversity and mean depth, thereby obliterating the normal patterns of diversity and longitudinal zonation. (Mortland-Battelle)
W74-06055

CAMBARUS BUNTINGI, A NEW SPECIES OF PUNCTICAMBARUS (DECAPODA, ASTACIDAE) FROM KENTUCKY AND TENNESSEE,
Tennessee Univ., Knoxville. Dept. of Zoology.
R. W. Bouchard.
The American Midland Naturalist, Vol 90, No 2, p 406-412, October 1973. 1 fig, 1 tab, 13 ref.

Descriptors: *Crayfish, *Distribution patterns, Habitats, *Tennessee, *Kentucky, Color, Ecological distribution, Systematics.
Identifiers: *Cambarus buntingi, *Puncticambarus, Decapods, Animal morphology.

Cambarus buntingi, a new species of crayfish from the Cumberland Plateau and Great Valley in Tennessee and the Cumberland Plateau in Kentucky, is described. Color notes, relationships, distribution, life history notes and ecological data are given. (Mortland-Battelle)
W74-06056

THE TRAPPING OF AQUATIC HYPHOMYCETE SPORES BY AIR BUBBLES,
Exeter Univ. (England). Dept. of Biological Sciences.
S. H. Iqbal, and J. Webster.
Trans Br Mycol Soc. Vol 60, No 1, p 37-48. 1973. Illus.
Identifiers: *Air bubbles, *Anguillospora-Crassa, *Aquatic hyphomycete, Detergents, *Spores, Trapping, *Varicosporium-Elodeae.

A technique is described for estimating the rate of removal of aquatic hyphomycete spores from suspension by air bubbles, and for calculating the trapping efficiency of an air bubble. Values for trapping efficiency are given for different kinds of hyphomycete spore. In general, the branched type of spore is more readily removed from suspension than spores of conventional shape, although the trapping of the sigmoid spores of Anguillospora crassa is quite effective. Evidence is presented for Varicosporium elodeae that as the complexity of branching of the spore increases, the effectiveness of trapping by air bubbles also increases. The addition of detergent causes an increase in the rate of removal of spores.--Copyright 1973, Biological Abstracts, Inc.
W74-06069

DISTRIBUTION OF VALLISNERIA SPIRALIS L. IN THE RIVER LEA NAVIGATION CANAL (ESSEX-HERTFORDSHIRE BORDER),
Royal Holloway Coll., Englefield Green (England). Dept. of Zoology.
S. Harris, and T. A. Lording.
Watsonia. Vol 9, No 3, p 253-256, 1973, Illus.
Identifiers: Canals, *England(River Lea), Flow, Navigation, Rivers, *Vallisneria-Spiralis, Water temperature, *Hydrophytes.

The occurrence of V. spiralis in the River Lea Navigation Canal was surveyed. The plant was the dominant hydrophyte over lengths of the canal, and its distribution in relation to water-flow, water temperature and other factors is discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-06072

CAN HALOBATES DODGE NETS. I: BY DAYLIGHT.,
Scripps Institution of Oceanography, La Jolla, Calif.
L. Cheng.
Limnology and Oceanography, Vol 18, No 4, p 663-665, July 1973. 1 fig, 2 tab, 8 ref.

Descriptors: *Insects, *Zooplankton, Surface waters, *Light, *Environmental effects, Diurnal, Oceans, Water sampling, Plankton nets, Biorhythms, *Nets.
Identifiers: *Halobates spp, Ocean striders, Hemiptera.

The genus Halobates comprises oceanic insects closely related to the pond-skaters of freshwater lakes and streams; they are the only insects known to live in the open ocean. Evidence is presented for active net avoidance by ocean-striders, based on analyses of catch data. The Halobates samples studied were all collected by horizontal surface plankton hauls. A circular net, 1 m in mouth diameter, was towed half-submerged on one side of the ship, for about 20 min at a speed of 2.5-3.5 km/hr, thus covering an area of about 1,000 sq m during each tow. A total of 1,649 surface samples were examined for Halobates; half (822) were collected during the day (between 0600 and 1800 hours) and the others at night. A comparison was made of the percentages of positive catches by day and by night. The monthly mean positive percentage was 16.3 among day samples, among night samples it was 40.3. The relatively lower numbers of Halobates collected during daylight hours can be attributed to visual avoidance of the net. The data suggest that in the daytime Halobates can see and tend to avoid approaching nets. Consequently, population densities of these insects, based on daytime samples, may be underestimated by a factor of 2 or 3. (See also W74-06118) (Mortland-Battelle)
W74-06117

CAN HALOBATES DODGE NETS. II: BY MOONLIGHT.,
Scripps Institution of Oceanography, La Jolla, Calif.
L. Cheng, and J. T. Enright.
Limnology and Oceanography, Vol 18, No 4, p 666-669, July 1973. 5 fig, 1 tab, 3 ref.

Descriptors: *Insects, *Zooplankton, *Light, *Insect behavior, *Environmental effects, Surface waters, Diurnal, Oceans, Plankton nets.
Identifiers: *Halobates spp, *Lunar periodicity, Ocean striders, Lunar phases, Hemiptera.

Evidence has been presented that ocean-skaters (Halobates) are able to avoid surface plankton nets towed during daylight hours. Only night samples collected between 1800 and 0600 hours were considered. They comprised 2,712 animals, caught in 827 samples taken on 333 days during 16 sequential calendar months. A breakdown of resultant data indicates that Halobates may have been better able to avoid the net during full moon: the insects were found in 38 percent of all samples taken around new moon, but in only 24 percent of samples taken during full-moon nights. A statistical test of the totals supports the interpretation that this difference is significant but such testing is not entirely appropriate because of the conspicuous heterogeneity in the data. Therefore, further

analyses were undertaken, involving periodograms. The three periodograms clearly indicate the expected lunar and bilunar peaks. None of these analyses can provide rigorous and irrefutable evidence for a lunar periodicity in the available data. Nevertheless, the internal consistency of the periodogram analyses as well as the biological plausibility of the apparent phase relationship with the moon support the initial hypothesis that Halobates may, indeed, be able to see an approaching net by the light of the moon, and on moonlight nights to dodge it more successfully than in darkness. (See also W74-06117) (Mortland-Battelle)
W74-06118

FIRST RECORDS OF THE CHINESE MITTEN CRAB, ERIOCHEIR SINENSIS, (CRUSTACEA:BRACHYURA) FROM NORTH AMERICA,
Lake Erie Fisheries Research Station, Wheatley (Ontario).
S. J. Nepszy, and J. H. Leach.
Journal of the Fisheries Research Board of Canada, Vol. 30, No. 12, Pt. 1, p 1909-1910, December 1973. 5 ref.

Descriptors: *Lake Erie, *Crustaceans, *Crabs, Aquatic animals, Invertebrates, Spatial distribution, Gill nets.
Identifiers: *Chinese mitten crab, Detroit River, Macroinvertebrates, Eriocheir sinensis.

Three specimens of the Chinese mitten crab, Eriocheir sinensis H. Milne Edwards, were captured commercially by gillnets in Lake Erie in April and May, 1973. Also, a specimen was collected from a water-intake pipe opposite Belle Isle in the Detroit River at Windsor, Ontario in October, 1965. The crab, a catadromous species with a thick mass of hair on each of the chelipeds, is indigenous to the low-lying areas of northern China and as far south as Shanghai. In Europe, where it was found in 1912 in a tributary of the Weser River in Germany, it has spread to the south of France and is spreading to low-lying areas of Germany, Scandinavia, Holland, and Belgium. Presumably the crabs were carried to Lake Erie in ballast tanks of a ship or ships. The crab is a serious pest in Europe, where it causes erosion of river banks because of its burrowing habit. It damages nets, eats bait and netted fish, and reduces potential fish food. Though the crab is unlikely to become established in Lake Erie or the upper Great Lakes, accidental introduction to an estuarine system might permit it to become established in North America. (Mortland-Battelle)
W74-06171

INLAND WATERS, VOL 16, PART 6. FRESHWATER PHYTOPLANKTON. SYSTEMATICS AND BIOLOGY, (IN GERMAN),
G. Huber-Pestalozzi.
E. Schweizerbart'sche Verlagsbuchhandlung: Stuttgart, West Germany, 1972. 116 p, Illus.
Identifiers: Asterococcaceae, Bibliographies, *Biology, Publications, Chaetochloridaceae, Characiosiphonaceae, Chlorangiellaceae, Cytology, Distribution, Ecology, Fresh, Gloeococcaceae, *Inland waters, Nautococcaceae, *Pytoplankton, Prasinocladaceae, Reproduction, *Systematics, *Tetrasporaceae.

This monograph presents a revision of the planktonic and benthic freshwater tetrasporales of the world. A total of 8 families (Gloeococcaceae, Asterococcaceae, Chlorangiellaceae, Chaetochloridaceae, Tetrasporaceae, Nautococcaceae, Characiosiphonaceae, Prasinocladaceae), 44 genera and 124 spp. are described. Keys for the determination of the families, genera and species are given. Geographical data are included for the species. Morphology and cell structure, reproduction, occurrence and ecology are discussed. A bibliography, subject and author indexes and an extensive number of illustrations are included.--Copyright 1973, Biological Abstracts, Inc.
W74-06235

INFLUENCE OF DEVELOPMENT IN VICIA VILLOSA AND VICIA SATIVA BY THEIR NODULES AND BY CLIMATIC CONDITIONS: I. DEVELOPMENT OF NODULES IN VICIA VILLOSA AND IN VICIA SATIVA DURING VEGETATIVE PERIOD, (IN GERMAN),
Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Rostock (East Germany). Institut fuer Pflanzenzuechtung.
H. Risch.
Biochem Physiol Pflanz (BPP). Vol 162, No 6, p 538-546, 1971. Illus. (English summary).
Identifiers: Climatic, Flowering, *Nodules, Vegetative period, *Vicia-sativa, *Vicia-villosa.

In humid summers, V. villosa did not finish development, produced a luxuriant green mass and a high rate of flowers. Fruit and seed production were low, but the mass of active nodules was extraordinarily high. Older nodules were able to sprout giving a rise to new active nodules. Independent of the climatic conditions V. sativa completed development. Only a few flowers were formed, but seed production was very high. Sprouting of nodules was never observed. Nodules decline and reduction in the number and mass of the nodules begins with fruiting. The tendency of branching in the nodules of V. villosa increased with increasing soil moisture. The morphology of nodules of V. sativa remained unchanged. Soil moisture had no influence on flowering time in V. sativa.--Copyright 1973, Biological Abstracts, Inc.
W74-06240

STOMATAL RESPONSES TO CHANGES IN HUMIDITY IN PLANTS GROWING IN THE DESERT,
Wuerzburg Univ. (West Germany). Botanisches Institut II.
E. D. Schulze, O. L. Lange, U. Buschbom, L. Kappen, and M. Evenari.
Planta (Berl). Vol 108, No 3, p 259-270, 1972. Illus.
Identifiers: Apricot, Deserts, Hammada-scoparia, *Humidity, Prunus-armeniaca, Soils, *Stomatal response, Zygophyllum-dumosum, *Negev Desert, Xeromorphic plants, Mesomorphic leaves.

The stomata of plants growing in the Negev Desert, namely the stomata of the mesomorphic leaves of Prunus armeniaca, the xeromorphic stems of Hammada scoparia, and the succulent leaves of Zygophyllum dumosum, respond to changes in air humidity. Under dry air conditions diffusion resistance increases. Under moist air conditions diffusion resistance decreases. When the stomata close at low air humidity the water content of the apricot leaves increases. The stomata open at high air humidity in spite of a decrease in leaf water content. This excludes a reaction via the water potential in the leaf tissue and proves that the stomatal aperture has a direct response to the evaporative conditions in the atmosphere. In all species the response to air humidity is maintained over a period of many hours when the soil is considerably dry. The response is higher in plants with poor water supply than in well watered plants. Thus for field conditions and for morphologically different types of photosynthesizing organs the results confirm former experiments carried out with isolated epidermal strips.--Copyright 1973, Biological Abstracts, Inc.
W74-06241

WATER METABOLISM AND DYNAMICS OF LABELED PHOSPHORUS IN APPLE LEAVES, (IN RUSSIAN),
For primary bibliographic entry see Field 3F.
W74-06245

EFFECT OF WATER DEFICIENCY AND LIGHT REGIME ON PHOTOSYNTHETIC ACTIVITY OF LEAVES, (IN RUSSIAN),
Akademiya Nauk Estonskoi SSR, Tartu. Institut Fiziki i Astronomii.
Kh. A. Moldau.
Fiziol Rast. Vol 19, No 6, p 1139-1145, 1972. Illus. (English summary).
Identifiers: *Betula-verrucosa, *Goutweed, *Hazelnut, Leaves(Water deficiency), Light regime, *Lily-of-the-Valley, Stomata, Mesophyll, *Photosynthesis, Primula-veris, Herbaceous plants.

The effect of water deficiency and light regime on the mesophyll and stomatal conductivity was studied with the leaves of woody and herbaceous plants (lily-of-the-valley) Primula viris, goutweed, hazelnut and Betula verrucosa in a deciduous forest. The measurements were carried out in a conditioned single-leaf chamber at a constant (saturating) light intensity and CO2 deficiency. The mesophyll conductivity did not depend on water potentials in the leaves within the range from -2.5 to -18.0 bars. Inhibition of the intensity of photosynthesis within this range was due only to a decrease in the stomatal conductivity. A gradual adaptive increase of the mesophyll conductivity was registered in the leaves from shaded plants exposed to the full sunlight. In the course of this adaptation the shaded plants acquired the properties of the light plants. More rapid changes in the mesophyll conductivity, reflecting the light regime of the plant during previous shorter periods of time, were discernible.--Copyright 1973, Biological Abstracts, Inc.
W74-06246

EFFECT OF ILLUMINATION AND WATER TEMPERATURE ON CRITICAL FLOW RATES FOR FISH, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Evolutionary Morphology and Animal Ecology.
D. S. Pavlov, Yu. N. Sbikin, A. E. Vashchinnikov, and A. D. Mochek.
Vopr Ikhtiol. Vol 12, No 4, p 769-778, 1972. Illus.
Identifiers: Acipenser-guldenstadti, Acipenser-stellatus, Fish, Flow, Gobio-gobio, Leucaspius-delineatus, Nemachilus-barbatulus, Perca-fluviatilis, Rutilus-rutilus, Rutilus-rutilus-caspicus, Scardinus-erythrophthalmus, *Water temperature, *Fish vision, *Water tunnels.

The critical rate of flow in a water tunnel for Acipenser stellatus, A. guldenstadti, Rutilus rutilus, R. rutilus caspicus, Scardinius erythrophthalmus, Leucaspius delineatus, Gobio gobio, Nemachilus barbatulus and Perca fluviatilis was largely related to conditions of visual orientation. Changes in illumination had a particularly strong effect on fish in which the primary receptor was vision. For bottom fish with mainly tactile reception the critical rate at all levels of illumination was about the same. Changes in water temperature had a strong effect on the swimming ability of fish. The critical rate of flow reached a maximum at different temperatures for different species.--Copyright 1973, Biological Abstracts, Inc.
W74-06250

EFFECT OF DEHYDRATION ON ATPASE ACTIVITY IN POIKILOHYDROUS AND HOMEOHYDROUS PLANTS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology.
N. D. Pronina.
Fiziol Rast. Vol 19, No 4, p 863-864. 1972.
Identifiers: *Atpase, Atrichum-Undulatum, *Dehydration, *Homeohydrous plants, Nectria-crispa, Parmelia-aspera, Poikilohydrous plants.

ATPase activity during dehydration was determined in homogenate tissue of Nectria crispa L., Parmelia aspera Massal and Atrichum undulatum L. Insignificant dehydration stimulated ATPase activity in A. undulatum but further dehydration

(up to 16%) sharply decreased ATPase activity. Up to 70-87% and 60% of ATPase activity was retained in N. crispa and P. aspera, respectively, under similar conditions. ATPase activity was observed 3 min after watering N. crispa plant which had been kept in a dry state with 8.2% humidity for 8 mo.--Copyright 1973, Biological Abstracts, Inc.
W74-06255

BIOMASS AND BIOLOGICAL PRODUCTIVITY OF THE MOST TYPICAL PLANT COMMUNITIES OF LOWER VAKHSH, (IN RUSSIAN),
Dushanbinskii Gosudarstvennyi Pedagogicheskii Institut (USSR).
A. Sh. Shukurov.
Probl Osvoeniya Pustyn'. 5. p 63-66, 1972. English summary.
Identifiers: *Biological communities, *Biomass, Deserts, Forests, Herbs, *Productivity, *USSR(Vakhsh region).

Annual increment of plant biomass in the flood area was 200 times more than that of clayish deserts. In brush wood of tall herbaceous vegetation it was 2-3 times more than that of tugai forests. In tugai forests, increment of plant matter occurs, mainly, in herbs, not trees.--Copyright 1973, Biological Abstracts, Inc.
W74-06423

SOIL MOISTURE PATTERNS ON TWO CHAINED PINYON-JUNIPER SITES IN UTAH,
Utah State Univ., Logan. Coll. of Natural Resources.
For primary bibliographic entry see Field 2G.
W74-06459

RUNOFF AND SEDIMENT YIELDS FROM RUNOFF PLOTS ON CHAINED PINYON-JUNIPER SITES IN UTAH,
Utah State Univ., Logan. Coll. of Natural Resources.
For primary bibliographic entry see Field 2J.
W74-06460

MOISTURE STRESSES IN ARIZONA MIXED CONIFER SEEDLINGS,
Forest Service (USDA) Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
J. R. Jones.
USDA Forest Service Research Paper RM-86, April, 1972. 8 p, 5 fig, 13 ref.

Descriptors: *Moisture stress, *Coniferous forests, *Dry seasons, Moisture uptake, Soils, Soil moisture, Moisture deficit, Regime, Root zone, Field capacity, *Arizona, Snowpacks, Photosynthesis, Douglas Fir trees, Ponderosa Pine trees, Diurnal.
Identifiers: *Seedlings, Pressure bomb.

Measured moisture stresses of various mixed conifer seedlings examined in Arizona during the dry season showed that dry season effects were not as severe as commonly thought, with no measurements approaching what the literature defines as critical. No severe moisture stresses were found in planting stock-sized seedlings. In other areas with similar moisture regimes, drought is not a major factor in seedling survival, and in pines, not even in the first dry season, except where there is heavy grass cover. Knowledge of plant moisture stress may be used in modeling of moisture regimes, or used to test and/or modify vegetation or physiographic site types. (Mastic-Arizona)
W74-06461

SOIL MOISTURE RESPONSE TO SPRAYING BIG SAGEBRUSH THE YEAR OF TREATMENT,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
D. L. Sturges.
Journal of Range Management, Vol 26, No 6, p 444-447, November 1973. 3 fig, 1 tab, 6 ref.

Descriptors: *Soil moisture, *Sagebrush, *Spraying, *2,4-D, *Herbicides, Water yield, Range management, Root zone, Moisture meters, *Wyoming, Plant growth, *Chemcontrol.

Chemical control of sagebrush is becoming a chief management practice for improving rangeland production. Soil moisture loss was reduced 24% after spraying big sagebrush with 2,4-D in Wyoming between June 24 and September 30. Eighty-three percent of the reduction was located in soil 2 to 6 feet deep, due to the deep rooting characteristics of sagebrush. Results indicated that spraying can have a pronounced effect on the soil moisture regime under similar conditions, and that the reduction in moisture depletion was concentrated into a short time interval while the vegetation was actively extracting water. (Mastic-Arizona)
W74-06462

SEASONAL WATER POTENTIAL CHANGES IN SONORAN DESERT SHRUBS IN RELATION TO TOPOGRAPHY,
Arizona State Univ., Tempe. Dept. of Botany.
W. L. Halvorson, and D. T. Patten.
Ecology, Vol 55, No 1, p 173-177, Winter 1974. 3 fig, 1 tab, 17 ref.

Descriptors: *Shrubs, *Seasonal, *Soil-water-plant relationships, *Variability, *Plant physiology, Soil moisture, Desert plants, Diurnal, Moisture stress, *Arizona.
Identifiers: Water potential, Pressure-bomb, *Sonoran Desert, Cave Creek(Ariz).

Water potential in desert shrubs was studied during a one year period in the Sonoran Desert near Cave Creek, Arizona. Soil moisture was monitored by Colman blocks, with particular attention being paid to maximum and minimum water potentials on a seasonal and diurnal basis. The desert shrub Triangle bursage showed the greatest response to soil moisture changes seasonally, and demonstrated the lowest potential (-85 bars). Flat-top eriogonum also showed a high degree of response. Shrubs showing moderate response were jojoba, creosotebush, and Krameria. Cercidium microphyllum exhibited only slight responses to changing conditions, but showed high water potential during all periods. (Mastic-Arizona)
W74-06464

INFLUENCE OF VARIOUS INITIAL MOISTURE CONTENTS ON DECAY OF SITKA SPRUCE AND SWEETGUM SAPWOOD BY POLYPORUS VERSICOLOR IN THE SOIL-BLOCK TEST,
Lovelace Clinic., Albuquerque, N. Mex.
C. A. Peterson, and E. B. Cowling.
Phytopathology. Vol 63, No 2, p 235-237, 1973.
Identifiers: Decay, Liquidambar-styraciflua, Picea-sitchensis, *Polyporus-versicolor, *Sitka spruce, Soils, *Sweet-gum sapwood, Tests, *Soil moisture, Tree decay.

Thin wafers of Sitka spruce (Picea sitchensis (Borg) Carr.) and sweetgum (Liquidambar styraciflua L.) wood were adjusted to moisture contents of 6, 40, 45, 50, 60, 75 and 116 (spruce) or 122% (sweetgum) and then incubated with P. versicolor in ASTM (American Society for Testing Materials) Standard soil-block chambers for 4 and 8 wk. Initial moisture content had no effect on rate of decay. Sitka spruce proved highly resistant to decay by P. vesicolor; sweetgum, highly susceptible. Moisture contents of test wafers decreased substantially after 4 wk, indicating that the atmosphere within the decay chambers was unsaturated. Increases in moisture content above the fiber saturation point apparently resulted from water of metabolism, and water moved into the test wafers through invading fungus mycelium.--Copyright 1973, Biological Abstracts, Inc.
W74-06487

GROWTH AND FOOD CONVERSION OF RAINBOW TROUT REARED IN BRACKISH AND FRESH WATER,
Skidaway Inst. of Oceanography Savannah, Ga.
T. Murai, and J. W. Andrews.
U S Natl Mar Fish Serv Fish Bull. Vol 70, No 4, p 1293-1295. 1972. Illus.
Identifiers: Brackish water, *Food conversion(Fish), Fresh water, *Growth, *Rainbow trout, Reared, Salmo-Gairdneri, Survival.

The fact that temperature was not constant in all groups of Salmo gairdneri precluded a conclusive comparison of the performance of rainbow trout in brackish and fresh water. Rainbow trout were converted from fresh to 30% salinity in a period of 9 days and were reared to market size at this salinity. Trout fingerlings averaging 60 g each were reared to 266 g in 21C fresh water with a rapid individual growth rate and an acceptable survival and food conversion rate. Survival and growth rates and food efficiencies were excellent for trout reared in brackish water at an average temperature of 13.5C.--Copyright 1973, Biological Abstracts, Inc.
W74-06492

FOOD HABITS AND FEEDING CHRONOLOGY OF THE BLACKBANDED DARTER, PERCINA NIGROFASCIATA (AGASSIZ), IN HALAWAKEE CREEK, ALABAMA,
Alabama Cooperative Fishery Unit, Auburn.
D. Mathur.
Trans Am Fish Soc. Vol 102, No 1, p 48-55. 1973. Illus.
Identifiers: *Alabama(Halawakee Creek), Chronology, Coleoptera, Crustacea, *Darters(Black-Banded), Diptera, Ephemeroptera, Feeding, *Food habits, Percina-Nigrofascita, Plecoptera, Trichoperta.

In Halawakee Creek, Alabama, P. nigrogasciata showed 2 distinct feeding peaks; one in the morning and a higher one in late afternoon. Immature forms of Diptera, Ephemeropters, and Trichoptera were dominant in the diet over the 24-hr period. Although these organisms were most abundant in drift during the night, most were eaten during day light. Daytime feeding peaks suggest that P. nigrofasciata are visual feeders. Daily ration varied from 2.6-4.9% of the body weight. Optimum temperature range from maximal feeding in natural habitat was 17-23C. Feeding rate was low or high, above or below this temperature range. The fish were highly insectivorous. Numerically and on the basis of percent frequency of occurrence dipteran larvae were on the most important item in the diet throughout the year. Ephemeropteran nymphs constituted the bulk of the food by weight. Trichopteran larvae ranked third in importance. Other items which were eaten occasionally included copepods, cladocerans, amphipods, isopods, coleopteran larvae, and plecopteran nymphs. An almost complete absence of terrestrial food items and detritus (mud, sand, and gravel) and dominance of drift organisms in the diet organisms in the diet suggests subsurface feeding.--Copyright 1973, Biological Abstracts, Inc.
W74-06493

PLANT MOISTURE STRESS PATTERNS IN EUROTIA LANATA AND ATRIPLEX CONFERTIFOLIA,
Sydney Univ. (Australia). School of Biological Sciences.
L. D. Love, and N. E. West.
Northwest Sci. Vol 46, No 1, p 44-51. 1972. Illus.
Identifiers: *Atriplex-Confertifolia, Diurnal, *Eurotia-Lanata, *Moisture stress(Plant), Patterns, Rainfall, Seasonal, *Utah(Curlew Valley), Weather.

Pressure bomb measurements of diurnal and seasonal plant moisture stress in E. lanata and A. confertifolia were made during the 1968 and 1969 growing seasons in Curlew Valley, Utah. Highest values were recorded in early to mid afternoons of the driest, hottest periods. Rainfalls of more than 8 mm generally resulted in immediate reduction of stress values. Differences in plant distribution patterns could not be explained by differences in plant moisture stress data.--Copyright 1973, Biological Abstracts, Inc.
W74-06497

2J. Erosion and Sedimentation

TRANSFER OF HEAVY METAL POLLUTANTS FROM LAKE ERIE BOTTOM SEDIMENTS TO THE OVERLYING WATER,
Bowling Green State Univ., Ohio. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W74-05956

A RE-EXAMINATION OF THE USE OF THE SILT/CLAY RATIOS AS INDICATORS OF SEDIMENTARY ENVIRONMENTS: A STUDY FOR STUDENTS,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Geoscience Center.
B. R. Pelletier.
Maritime Sediments, Vol 9, No 1, p 1-12, April 1973. 11 fig, 3 tab, 22 ref.

Descriptors: *Silts, *Clays, *Sedimentology, Sedimentation, Sediment transport, Stratigraphy, Deposition(Sediments), Particle Size.
Identifiers: *Silt-clay ratio.

The silt/clay ratio may be used for the purpose of distinguishing aqueous environments of deposition providing the following interrelationship are understood: nature and availability of material at the source area; distance from source area; depth of water; energy available at the site of deposition; and the action of electrolytes in seawater as well as other chemical, biochemical and organic processes. Generally the silt/clay ratio is higher in the marine environment than in the lacustrine, due mainly to the action of electrolytes on suspended sediments in the sea. However in deep marine waters, the silt/clay ratios have the same low values as those for sediments in the much shallower lacustrine bodies. In the lacustrine and marine environment the silt/clay ratio generally decreases with a decrease in the mean size of sediment, increasing remoteness from shore, increasing water depth, and decreasing hydrodynamic vigor. (Knapp-USGS)
W74-05989

TRACE METALS IN SEDIMENTS OF NEW YORK BIGHT,
Westchester Community Coll., Valhalla, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-06012

FACTORS AFFECTING THE BEHAVIOR OF FIVE CHLORINATED HYDROCARBONS IN TWO NATURAL WATERS AND THEIR SEDIMENTS,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W74-06064

EFFECTS OF MEANDERING ON SEDIMENT DISCHARGES AND FRICTION FACTORS OF ALLUVIAL STREAMS,
Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
Y. Onishi.
Available from the National Technical Information Service as PB-230 946 $12.00 in paper copy, $1.45 in microfiche. Ph D Thesis, December 1972. 158 p, 37 fig, 3 tab, 27 ref, 2 append. OWRR A-029-IA (4).

Descriptors: *Sediment transport, *Meanders, *Alluvial channels, Suspended load, Bed load, Channel morphology, *Sediment discharge, Flumes, Hydraulic models, Turbulent flow, Hydraulics.

The effects of channel meandering and of width of sinuous streams on the sediment loads and the friction factors of the flows were studied in flume experiments. Thirteen triplets of experiments were conducted in the subcritical flow domain in one straight and two meandering laboratory channels with sand beds and rigid walls. In each run, measurements were made of water-surface profiles, bed elevations, and total sediment discharge. In addition, detailed measurements of the distributions of the magnitude and direction of the local velocity and of suspended sediment concentration were made in two of the meandering-channel experiments. For given flow conditions, the sediment discharge per unit width in the full-width meandering channel is greater than that in the straight flume, which in turn is greater than in the half-width meandering channel. This is mainly due to the opposing effects of secondary circulation on the entrainment and suspension of sediment, and the nonuniform distribution of the unit discharge across the channel. The bend-loss coefficient increases with Froude number, the ratio of bed hydraulic radius-median sand diameter, and the ratio of width-centerline radius of curvature. This variation of bend-loss coefficient is primarily due to the bedform drag exerted on the point bar, and is probably modified by alteration of small-scale bed forms and by the modification of velocity distribution across the channel due to secondary flow. The enlargement of the point bars with increasing channel width may result from the increased velocity near concave walls, which in turn is due to the increased depth in this region produced by secondary circulation. (Knapp-USGS)
W74-06258

PRELIMINARY INVESTIGATIONS OF AN INTERTIDAL SAND BODY, COBEQUID BAY, BAY OF FUNDY,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 2L.
W74-06260

BEACH FORESHORE SEDIMENTOLOGY AND MORPHOLOGY IN THE APOSTLE ISLANDS OF NORTHERN WISCONSIN,
California State Univ., Fullerton. Dept. of Geography.
W. N. Engstrom.
Journal of Sedimentary Petrology, Vol 44, No 1, p 190-206, March 1974. 6 fig, 2 tab, 48 ref.

Descriptors: *Beaches, *Sedimentation, *Wisconsin, Gravels, Sands, Particle size, Particle shape, Sediment sorting, *Regression analysis, Sediment transport, Statistical methods, *Lake Superior.
Identifiers: *Apostle Islands(Wisc).

Foreshore sediments and slopes of 39 beaches in the Apostle Islands of northern Wisconsin are related to wave energy, wave steepness and offshore slope. Stepwise regression analysis was used to link the response variables with the process variables. Wave parameters were hindcast using the S-M-B wave hindcasting procedure and were also inferred from foreshore morphology. Mean grain size of the foreshore sediments is weakly related to the process variables and is primarily a function of local source materials. Sorting of the sediments shows a strong positive relationship with the percentage of gravel in the sample and a weak positive relationship with angle of wave approach and wave height. Weakly negatively skewed sediments are associated with high energy and strong longshore movement which flatten and coarsen the foreshore, serving to weaken the winnowing effect of backwash and increasing the degree of trapping of fines. Low energy situations with a minimum of longshore drift operate to add finer material to the foreshore and thereby steepen it which facilitates the winnowing process, producing strongly negatively skewed sediments. More platykurtic grain-size distributions are associated with the relatively coarse-textured, less negatively skewed sediments of flatter foreshores while the more leptokurtic grain-size distributions typify the relatively fine-textured, more negatively skewed sediments characteristic of steeper foreshores. Foreshore slopes are related to mean grain size, wave energy and wave steepness. Steep foreshore slopes are associated with fine-textured sediments, suggesting the effects of constructive wave activity. Foreshore slopes are also generally inversely related to both wave steepness and wave energy. (Knapp-USGS)
W74-06281

SEDIMENTATION RATES AND RECENT SEDIMENT HISTORY OF LAKES ONTARIO, ERIE AND HURON,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
A. L. W. Kemp, T. W. Anderson, R. L. Thomas, and A. Mudrochova.
Journal of Sedimentary Petrology, Vol 44, No 1, p 207-218, March 1974. 4 fig, 6 tab, 44 ref.

Descriptors: *Sedimentation rates, *Lake Ontario, *Lake Erie, *Lake Huron, Mercury, Sedimentation, Deposition(Sediments), Bottom sediments, Water pollution, Great Lakes, Land use, Soil erosion.

Sedimentation rates and changes in organic carbon, nitrogen, phosphorus and mercury concentrations were determined for 14 core locations, representing basins of fine-grained sediment in Lakes Ontario, Erie and Huron. Present-day sedimentation rates were high in Lake Erie, ranging from 847 to 5,049 g per sq m per yr, low to intermediate in Lake Ontario, ranging from 366 to 1,156 g per sq m per yr, and low in Lake Huron, ranging from 147 to 325 g per sq m per yr. There has been a threefold increase in sedimentation rate in Lake Erie since 1935 and the Kingston basin of Lake Ontario since 1930. The nutrient and Hg concentrations are enriched at the sediment surface in all the cores from Lakes Ontario and Erie, while the Huron cores show little change at the surface from their background concentrations. The enrichments are attributed to increased nutrient and Hg loading to the Ontario and Erie sediments, with the major increases after about 1950. The present-day loading of nutrients and Hg to the sediments parallels the rates of sedimentation at each location, being greatest in Lake Erie. Early-colonial loading of nutrients and Hg to Lake Ontario and Erie are generally similar to the modern loading of Lake Huron. The total loading of sediment, nutrients and Hg was estimated for each lake. Present-day sediment accumulation of 4,600,000, 23,400,000, and 3,900,000 metric tons was estimated for Lake Ontario, Erie and Huron, respectively. (Knapp-USGS)
W74-06282

SEDIMENTARY REFLECTION OF DEPOSITIONAL ENVIRONMENT IN THE BARDAWIL LAGOON, NORTHERN SINAI,
Geological Survey of Israel, Jerusalem. Marine Geology Div.
For primary bibliographic entry see Field 2L.
W74-06283

AN INEXPENSIVE TITRATION METHOD FOR THE DETERMINATION OF ORGANIC CARBON IN RECENT SEDIMENTS,
New Hampshire Univ., Durham. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5A.
W74-06284

DETERMINATION OF MONTMORILLONITE IN SMALL SAMPLES AND IMPLICATIONS FOR SUSPENDED-MATTER STUDIES,
Woods Hole Oceanographic Institution, Mass.
B. E. Tucholke.
Journal of Sedimentary Petrology, Vol 44, No 1, p 254-258, March 1974. 2 fig, 1 tab, 10 ref. NSF Grant GA24872.

Descriptors: *Montmorillonite, *X-ray diffraction, *Bottom sediments, Analytical techniques, Mineralogy, Oceanography.

The clay-size fraction of a deep-sea sediment sample from the western North Atlantic Ocean was analyzed for montmorillonite, illite, kaolinite and chlorite by X-ray diffraction of samples on silver filters. Samples with concentrations on the filters of less than about 1.6 mg per sq cm show an artificial depletion of montmorillonite or mixed-layer montmorillonite-illite and enrichment of illite relative to samples of higher concentrations. Calculated compositions of kaolinite and chlorite tend to remain constant at any concentration where these minerals are readily detectable. This is important for mineralogical studies of suspended particulate matter samples from the deep ocean, where samples with a total weight of only a few milligrams are normally recovered. X-ray diffraction analysis of such small samples may give the spurious results of montmorillonite-poor, illite-enriched particulate matter. (Knapp-USGS)
W74-06285

DETRITAL QUARTZ AS A NATURAL TRACER-FOURIER GRAIN SHAPE ANALYSIS,
Michigan State Univ., East Lansing. Dept. of Geology.
R. Ehrlich, J. J. Orzeck, and B. Weinberg.
Journal of Sedimentary Petrology, Vol 44, No 1, p 145-150, March 1974. 8 fig, 1 tab, 6 ref.

Descriptors: *Sands, *Beach erosion, *Particle shape, *Tracers, *Provenance, Statistical methods, Fourier analysis, Beaches, Alluvium, Quartz.

Quartz grain shape is a highly satisfactory natural tracer of sediment flux and accumulation. Sands from a river-beach-cliff complex near Oceanside, California, were analyzed in terms of the variation of the closed-form Fourier amplitude spectra of maximum projection shapes of about 100 grains per sample. The data were analyzed by hierarchical analysis of contingency tables and discriminant functions. River, beach, and cliff samples are clearly defined. At the end of the dry season, longshore drift had removed most of the sand of the San Louis Rey River from the beach, except at an area adjacent to a pier where at least 25% of sand grains were river-derived. During the dry season the unconsolidated beach cliff is the dominant source of beach sand. (Knapp-USGS)
W74-06293

CARBONATE CEMENTATION IN CORALLINE ALGAL NODULES IN THE SKAGERRAK, NORTH SEA: BIOCHEMICAL PRECIPITATION IN UNDERSATURATED WATERS,
Uppsala Univ. (Sweden). Dept. of Historical Geology and Paleontology.
T. Alexandersson.
Journal of Sedimentary Petrology, Vol 44, No 1, p 7-26, March 1974. 8 fig, 95 ref. Swedish NSRC Grant 3045-4.

Descriptors: *Coral, *Algae, *Atlantic Ocean, Carbonate rocks, Calcite, Carbonates, Chemical precipitation, Calcium, Magnesium, Sea water.
Identifiers: *North Sea(Skagerrak).

Carbonate sediments in the Skagerrak are affected by submarine dissolution which attacks skeletal grains of aragonite, Mg-calcite, and low-Mg calcite, and coarse detrital calcite in limestone clasts. Evidently, the sublittoral marine environment is undersaturated with calcium carbonate. Yet, in this environment, carbonate cement is forming in various kinds of openings within living coralline algal nodules (rhodoliths) consisting mostly of Lithothamnium. The internal cement is composed of aragonite needle cement, aragonite spherulitic cement, Mg-calcite fringe cement, Mg-calcite micrite, and Mg-calcite intraskeletal microdruses. Cement growth is related to metabolic activities in the living carbonate-secreting red algae. After death of the algae, the rhodoliths and their cement undergo dissolution. Biochemical influence of frame-building algae may be an important cause for internal cementation of reefs and algal crusts in the marine environment. (Knapp-USGS)
W74-06294

HELIUM ISOTOPES IN OCEAN SEDIMENTS (IZOTOPY GELIYA V OSADKAKH OKEANOV),
Akademiya Nauk SSSR, Leningrad. Fiziko-Tekhnicheskii Institut.
A. Ya. Krylov, B. A. Mamyrin, Yu. I. Silin, and L. V. Khabarin.
Geokhimiya, No 2, p 284-288, February 1973. 3 tab, 8 ref.

Descriptors: *Geochemistry, *Isotope studies, *Helium, *Sediments, Oceans, *Pacific Ocean, Atlantic Ocean, Clays.
Identifiers: USSR, Oozes.

The He-3/He-4 ratio in deep-sea red clays of the Pacific Ocean is large. The ratio in Atlantic red clays is also large but smaller by an order of magnitude than that for surface samples from the Pacific. The He-3/He-4 ratio in silty-pelite and sandy oozes near continents is the same as in rocks of the earth's crust. A large He-3/He-4 ratio in slowly formed deep-sea oozes is due to the presence of a large amount of meteoric material, which has a high He-3 content. The He-3/He-4 ratio in oozes may serve as an indicator of cosmic material and, hence, be useful in locating regions most favorable for finding remote transuranium elements of cosmic origin. (Josefson-USGS)
W74-06307

THE IONIUM-THORIUM METHOD OF DETERMINATION OF ABSOLUTE AGE AND RATE OF DEPOSITION OF BOTTOM SEDIMENTS (K VOPROSU OPREDELENIYA ABSOLYUTNOGO VOZRASTA I SKOROSTI SEDIMENTATSII DONNYKH OTLOZHENIY IONIY-TORIYEVYM METODOM),
D. S. Nikolayev, Ye. I. Yefimova, A. I. Il'in, and I. I. Shurko.
Geokhimiya, No 2, p 279-283, February 1973. 5 tab, 8 ref.

Descriptors: *Isotope studies, *Radioisotopes, *Bottom sediments, *Deposition(Sediments), *Sedimentation rates, Cores, Radiochemical analysis, *Atlantic Ocean.
Identifiers: USSR, *Ionium-thorium age method.

Radiochemical investigations were conducted in the Atlantic Ocean off the Gulf of Guinea to determine the age and deposition rate of bottom sediments. The depth distribution of Io and Ra concentrations in two bottom cores do not reflect the decay of these elements with time. The Th concentration varies unevenly with depth, increasing toward the lower part of the core and reaching the maximum value at a depth of 210-220 cm. Inconsistencies in absolute ages calculated for successive sediment layers are attributed to underwater slumping, thorium migration in the sediments, and to presence of continental or volcanic detrital materials containing large amounts of Io or Th. (Josefson-USGS)
W74-06308

ORIGIN AND DEVELOPMENT OF BEACH CUSPS AT MONTEREY BAY, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
D. H. Smith.
Available from NTIS as AD-769 672 for $5.50 in paper copy. Master's thesis, September 1973. 63 p, 13 fig, 3 tab, 20 ref.

Descriptors: *Erosion, *Deposition, *Beaches, California, Beach erosion.
Identifiers: *Beach cusps, *Cusp formation, Sediment size, Monterey(Calif.), *Wave height, Breaker angle, Beach slope.

Beach cusps were observed daily on Del Monte Beach, California, and measurements obtained so that a quantitative description of the parameters which affect formation and size of cusps could be determined. In addition a theory of cusp formation was formulated and an insight obtained into the factors which influence the shape and size of cusps throughout their lifetime. Finally, the events leading to cusp destruction were examined. It was determined that beach cusps are depositional in nature, forming most easily in coarse, loose, sediment. Cusp development commences at a rise or area of accretion on the beach. A series of beach cusps forms sequentially rather than simultaneously. The width of beach cusps are a function of wave height; the larger waves producing wider cusp spacing. Uniform spacing of cusps in a series can be attributed to the same size waves striking the beach during the formation period of the cusps. Once formed, cusps are stable and tend to maintain their dimensions unless a large change in wave or beach condition occurs. (Sinha - OEIS)
W74-06313

THE KINEMATICS OF WATER PARTICLE VELOCITIES OF BREAKING WAVES WITHIN THE SURF ZONE,
Naval Postgraduate School, Monterey, Calif.
D. P. Richardson.
Available from NTIS as AD-769 423 for $5.00 in paper copy. Master's thesis, September 1973. 55 p, 19 fig, 1 tab, 12 ref.

Descriptors: *Waves(Water), *Surf, Measurement, Ocean waves.
Identifiers: Particle motion, *Particle velocities, Probability density functions, *Wave measurements, *Linear wave theory.

Simultaneous measurements of waves, and vertical and horizontal water particle velocities were made at the breaker-line within the surf zone using a capacitance type penetrating wave staff, a pressure wave gauge, and an electromagnetic current meter. Wave measurements were also made at seaward and shoreward locations. The wave energy-density spectral components were converted to velocity spectral components using linear wave theory. These computed values compared well qualitatively with the measured velocity spectra. Quantitatively, the results showed that linear theory underpredicted wave-induced horizontal velocity spectral components by about 50 percent at the frequency of peak energy. The coherence values between waves and horizontal velocity were high, ranging above 0.75. The phase angle computation showed the calculated velocity components leading the measured velocity components by an average of 20 degrees, indicating an unstable wave crest leading the particle motion in the body of the wave. Probability density functions were computed and compared to Gaussian and Gram-Charlier distributions using the chi-square goodness-of-Fit test. The Gram-Charlier

distribution qualitatively gave the better fit to the data. (Sinha - OEIS)
W74-06314

REMOTE SENSING OF OCEAN CURRENTS,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
G. A. Maul.
Available from NTIS as E73-10612 for $3.50 in paper copy. Interim Report for Period November 1972 - May 1973, Prepared for Goddard Space Flight Center, May 1973. 26 p, 4 fig, 10 ref.

Descriptors: Remote sensing, Currents(Water), Ocean currents, Color, Chlorophyll-a, Algae, Edge effect, Scattering.
Identifiers: ERTS imagery, Gulf of Mexico, Multispectral imagery, Sea state.

Monthly field experiments in support of the NOAA investigation of ocean color boundary determination using ERTS data have been conducted since June 1972. The boundary between coastal waters and the Loop Current has been detected by ERTS as a result of sea-state changes as well as color differences. Ocean information is contained in all 24 channels of the Bendix MSS flown on the C-130 in June 1972; this includes UV, visible, reflected IR and emitted IR. Computer enhancement of MSS data are revealing many features not shown in the NDPF product. Major ocean currents such as the Loop Current in the eastern Gulf of Mexico have surface manifestations which can be exploited for remote sensing. Surface chlorophyll-a concentrations, which contribute to the shift in color from blue to green in the open sea, were found to have high spatial variability; significantly lower concentrations were observed in the current. The cyclonic edge of the current is an accumulation zone which causes a peak in chlorophyll concentration. The dynamics also cause surface concentrations of algae, which have a high reflectance in the near infrared. Combining these observations gives rise to an 'edge effect' which can show up as a bright lineation on multispectral imagery delimiting the current's boundary under certain environmental conditions. Frequently the sea-state in the current is higher than in surrounding water due to differential shear. When high seas introduce bubbles, white caps, and foam, the reflectance is dominated by scattering rather than absorption. (Sinha - OEIS)
W74-06319

SPEED OF THE SOLITARY WAVE,
Hawaii Inst. of Geophysics, Honolulu; and National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
E. R. Spielvogel, and L. Q. Spielvogel.
Available from NTIS as PB-224 527 and PB-224 603 for $3.00 in paper copy. Report No HIG-73-2, NOAA-JTRE-67, prepared for the National Science Foundation, Office for the International Decade of Ocean Exploration, June 1973. 11 p, 3 fig, 5 ref. NSF AG-253.

Descriptors: *Waves(Water), *Shallow water, Ocean waves, Tsunamis.
Identifiers: *Solitary waves.

An exact relationship between the speed of a solitary wave and its decay at infinity is derived. It is then compared to the existing shallow water theory as an indication of the merits of the theory in describing the solitary wave at points distant from the crest. (Sinha - OEIS)
W74-06320

RHODE ISLAND COASTAL FIELD DAY: THE BARRIER BEACHES.
Available from NTIS as COM 73-11885 for $2.75 in paper copy. Rhode Island Coastal Field Day: The Barrier Beaches, September 15, 1973. 8 pages.

Descriptors: Barrier islands, Shore protection, Planning, Land use, Rhode Island, Coasts.
Identifiers: Coastal utilization.

This Field Day was designed to provide all interested Rhode Island citizens with information on the origin, natural characteristics, values and management of barrier beaches and associated ponds and marshes. The pamphlet was used as a field guide to various sites where citizens were given brief, explanations on the natural phenomena or processes which would assist them in making decisions in future land use planning. Explanations were given on the geology of the barrier islands, the fish and wildlife, salt marshes and plants that stabilize sand dunes. Finally, a discussion on planning the future of the barrier island complex was held. (Sinha - OEIS)
W74-06322

IMPACT OF MINING GRAVEL FROM URBAN STREAM BEDS IN THE SOUTHWESTERN UNITED STATES,
Arizona Univ., Tuscon. Dept. of Geosciences.
For primary bibliographic entry see Field 4C.
W74-06374

GEOLOGY AND GEOMORPHOLOGY OF THE CENTRAL GULF OF ALASKA CONTINENTAL SHELF,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W74-06434

REGIONAL SEDIMENT YIELD ANALYSIS OF ALASKA STREAMS,
Alaska Univ., College. Inst. of Water Resources.
G. L. Guymon.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY1, Paper 10255, p 41-51, January 1974. 3 fig, 2 tab, 4 ref, append. OWRR A-042-ALAS(2).

Descriptors: *Sediment yield, *Alaska, *Sediment load, Equations, *Regression analysis, Sedimentation, Suspended load, Statistical methods, Sampling, *Glaciohydrology.

Sparse suspended sediment data for Alaska were evaluated to verify regional sediment yield relationships and to test alternative regression correlations using readily obtained watershed parameters. Glacier-fed streams in the south-central region of Alaska were emphasized, although one nonglacial stream in the interior region of Alaska was included for comparison. Plausible, simple relationships can be developed for stream reaches well downstream from the glacier which delivers a high fraction of the total suspended sediment load. A great deal of uncertainty is associated with correlation attempts for short stream reaches near the glacier delivery source. (Knapp-USGS)
W74-06440

HYDROLOGY: PART II--SURFACE HYDROLOGY AND GEOMORPHOLOGY,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
For primary bibliographic entry see Field 3B.
W74-06447

MAPPING OF SUSPENDED-SEDIMENT DISCHARGE IN COMPLEX ATLASES (KARTOGRAFIROVANIYE STOKA VZVESHENNYKH NANOSOV V KOMPLEKSNYKH ATLASAKH),
Moscow State Univ. (USSR).
T. G. Svatkova, and I. S. Fedorova.
Vestnik Moskovskogo Universiteta, Seriya V, Geografiya, No 6, p 81-86, November-December 1973. 4 fig, 2 tab.

Descriptors: *Sediment discharge, *Suspended solids, *Maps, *Mapping, *Mountains, Elevation, Watersheds(Basins), Turbidity.
Identifiers: *USSR(Altay Mountains), Isolines.

Contents of maps of suspended-sediment discharge in 6 Soviet republic atlases are reviewed, and maps of river turbidity are compared with other maps of physiographic features in 4 atlases (Azerbaydzhan, Armenia, Georgia, and Tadzhikistan). A method is described for mapping turbidity of rivers in the Altay mountain system in southwestern Asiatic Russia, based on a relationship between turbidity and average basin elevation. (Josefson-USGS)
W74-06452

THE EFFECT OF LOGGING ON HILL DIPTEROCARP FOREST,
Forest Research Inst., Kepong (Malaysia). Colombo Plan.
For primary bibliographic entry see Field 4C.
W74-06454

RUNOFF AND SEDIMENT YIELDS FROM RUNOFF PLOTS ON CHAINED PINYON-JUNIPER SITES IN UTAH,
Utah State Univ., Logan. Coll. of Natural Resources.
G. F. Gifford.
Journal of Range Management, Vol 26, No 6, p 440-443, November 1973, 2 fig, 3 tab, 7 ref.

Descriptors: *Sediment yield, *Runoff, *Erosion, *Utah, Surface runoff, Soil profiles, Infiltration rates, Infiltrometers, Water yield improvement, Pinyon pine trees, Juniper trees, Mechanical controls.
Identifiers: *Pinyon-juniper, *Chaining, Windrows, Woodlands.

Runoff and sediment yields were studied over a 5 year period (1968-1972) on chained pinyon-juniper sites in Utah. Runoff plots 0.4 hectares in size were used on sites chained-with-debris-windrowed, chained-with-debris-in-place, and natural woodlands from which livestock was excluded. Runoff events occurred during only 2 years (1968-1970) of the study. Runoff amounts from the chained-with-debris-windrowed plots showed water yield increases of 1.2 to 5 times the yield from natural woodlands, with 1.6 to 6 times more sediment than the woodlands. Runoff was equal or less for plots chained-with-debris-in-place as compared to the natural woodlands. Sediment yields were also similar for the two sites. (Mastic-Arizona)
W74-06460

2K. Chemical Processes

TRANSIENT EXCESS-RADON PROFILES IN PACIFIC BOTTOM WATER,
Scripps Institution of Oceanography, La Jolla, Calif.
Y. C. Chung.
Earth and Planetary Science Letters, Vol 21, No 3, p 295-300, February 1974. 3 fig, 3 tab, 8 ref.

Descriptors: *Water chemistry, *Pacific Ocean, *Radioisotopes, Water circulation, Ocean currents, Diffisivity, Mixing, Diffusion, Dispersion.
Identifiers: *Radon.

Five near-bottom excess-radon profiles were measured at the Geosecs-I station in the northeast Pacific, at varying intervals over a period of 2 1/2 years. These profiles vary considerably in both structure and radon concentration, indicating transient characteristics of the bottom water in the deep Pacific. Only two of the five profiles are of the quasi-exponential type; the stationary vertical eddy diffusivities calculated from these two profiles are 129 sq cm/sec in November 1971, and

22 sq cm/sec obtained 5 months later. A single bottom-radon profile was measured in the western-boundary-current region of the South Pacific at the Geosecs-III station. This profile is also of the quasi-exponential type, with a vertical diffusivity of 32 sq cm/sec. Although the radon concentrations of the three quasi-exponential profiles and the calculated diffusivities are quite different, the integrated excess-radon inventory in the water column, and the calculated flux of radon across the sediment-water interface, vary by only a factor of two in the two areas studied. (Knapp-USGS)
W74-05990

EXTRA-TERRESTRIAL MN-53 IN ANTARCTIC ICE,
Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.
For primary bibliographic entry see Field 2C.
W74-05991

CHARACTERISATION AND MAGNETIC PROPERTIES OF NATURAL FERRIC GEL,
Centre National de la Recherche Scientifique, Grenoble (France). Transitions de Phases.
J. M. D. Coey, and P. W. Readman.
Earth and Planetary Science Letters, Vol 21, No 1, p 45-51, December 1973. 5 fig, 3 tab, 15 ref.

Descriptors: *Gels, *Iron, *Chemical precipitation, Analytical techniques, Magnetic studies, Infrared radiation.
Identifiers: *Mossbauer effect.

A natural ferric gel precipitated near freshwater springs was characterized by X-ray and electron diffraction, thermal, infrared, magnetic and Mossbauer measurements. It has the composition Fe(OH)3 . 0.9H20. The gel consists of ultrafine amorphous particles of size about 39 angstroms. Its presence is best detected using the Mossbauer effect. The isomer shift (relative to chromium), quadrupole splitting and line width at 296 K are respectively 0.50, 0.72 and 0.48 mm/sec. Above 100 K the susceptibility follows a Curie-Weiss law. Between 10 and 100 K it is superparamagnetic and below 10 K there is a stable magnetic order with the spins in a particle statistically distributed relative to the direction of their resultant moment (8.6 emu/g). (Knapp-USGS)
W74-05992

THE RESIDENCE TIME OF THORIUM IN SURFACE SEA WATER AND ITS IMPLICATIONS REGARDING THE RATE OF REACTIVE POLLUTANTS,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 5B.
W74-05995

SOLVENT EXTRACTION OF COPPER (II) AND ZINC (II) WITH 1,5-DIPHENYLCARBAZONE,
National Inst. for Researches in Inorganic Materials, Ibaraki (Japan).
For primary bibliographic entry see Field 5A.
W74-06088

GLASS ELECTRODE RESPONSES INTERPRETED BY THE SOLID STATE HOMOGENEOUS- AND HETEROGENEOUS-SITE MEMBRANE POTENTIAL THEORY,
North Carolina Univ., Chapel Hill. William R. Kenan, Jr. Lab. of Chemistry.
R. P. Buck, J. H. Boles, R. D. Porter, and J. A. Margolis.
Analytical Chemistry, Vol 46, No 2, p 255-261, February 1974. 13 fig, 4 tab, 22 ref.

Descriptors: *Ion exchange, *Selectivity, Model studies, Hydrogen ion concentration, Hydrogen, Sodium, Potassium, Cations, Temperature, Theoretical analysis, *Electrodes.
Identifiers: Glass electrodes, Mobility, *Solid state models, *Electrode responses, Ion selective electrodes, Lithium, Membrane electrodes, pH electrodes, Sodium electrodes.

A new theory of glass membrane electrode response based on a solid state model is illustrated by application to lithium and sodium responses of five commercially available low-error pH glass electrodes. Mobility, ion exchange, and overall selectivity parameters have been calculated at several interference activities and temperatures from 6 to 55 C. Beckman sodium selective electrode responses were measured for hydrogen, lithium, and potassium ions and characteristic parameters calculated. For the latter electrodes, conditions giving slow response, non-Nernstian slopes, and long-term drift were explored. The pH glass results suggest that the cation mobilities exceed those of protons while the reverse is found for the sodium-selective glass. The overriding effect of ion exchange selectively follows from the theoretical fit of the experimental data. (Holoman-Battelle)
W74-06095

THE STANDARD POTENTIAL OF THE SINGLE-CRYSTAL COPPER ELECTRODE IN AQUEOUS SOLUTIONS,
Copenhagen Univ. (Denmark). H. C. Oersted Inst.
F. Gronlund, and S. Noer.
Journal of the Electrochemical Society, Vol 121, No 1, p 25-29, January 1974. 3 fig, 2 tab, 13 ref.

Descriptors: *Aqueous solutions, *Zeta potential, *Equilibrium, *Measurement, *Electrochemistry, Electrical properties, *Electrodes.
Identifiers: Copper electrodes, Electromotive force, Silver-silver chloride electrodes.

A cell is described for measuring the equilibrium potential of the Cu/Cu(2 plus), H2O electrode. The cell was vacuum-tight and the water vacuum-distilled in order to eliminate oxygen; the solution was equilibrated with metallic copper before immersion of the electrodes. These were disk-shaped, oriented single crystals made from 99.999 percent copper and vacuum annealed before use. Pairs of differently oriented crystals showed potential differences smaller than 0.02 mV. The standard potential of such electrodes was determined by measuring the emf of cells of the type Ag, AgCl CuC12(M sub o), H2O/Cu with M sub o in the range from 0.00048-0.0025 M. The resulting value, standard potential of the Cu/Cu(2 plus) equals 335.2 plus or minus 0.4 mV at 25 C, is significantly lower than those generally accepted, probably because the accepted values were all obtained from measurements in relatively concentrated cupric sulfate solutions. (Holoman-Battelle)
W74-06149

LOSS OF MERCURY(II) FROM SOLUTION,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-06266

DETERMINATION OF MONTMORILLONITE IN SMALL SAMPLES AND IMPLICATIONS FOR SUSPENDED-MATTER STUDIES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2J.
W74-06285

CARBONATE CEMENTATION IN CORALLINE ALGAL NODULES IN THE SKAGERRAK, NORTH SEA: BIOCHEMICAL PRECIPITATION IN UNDERSATURATED WATERS,
Uppsala Univ. (Sweden). Dept. of Historical Geology and Paleontology.
For primary bibliographic entry see Field 2J.
W74-06294

HELIUM ISOTOPES IN OCEAN SEDIMENTS (IZOTOPY GELIYA V OSADKAKH OKEANOV),
Akademiya Nauk SSSR, Leningrad. Fiziko-Tekhnicheskii Institut.
For primary bibliographic entry see Field 2J.
W74-06307

THE IONIUM-THORIUM METHOD OF DETERMINATION OF ABSOLUTE AGE AND RATE OF DEPOSITION OF BOTTOM SEDIMENTS (K VOPROSU OPREDELENIYA ABSOLYUTNOGO VOZRASTA I SKOROSTI SEDIMENTATSII DONNYKH OTLOZHENIY IONIY-TORIYEVYM METODOM),
For primary bibliographic entry see Field 2J.
W74-06308

ARSENIC AND ANTIMONY IN THE TROPICAL ZONE OF THE ATLANTIC OCEAN (MYSH'YAK I SUR'MA V TROPICHESKOY ZONE ATLANTICHESKOGO OKEANA),
Akademiya Nauk URSR, Sevastopol. Marine Hydrophysics Inst.
A. I. Ryabinin, and A. S. Romanov.
Geokhimiya, No 2, p 257-269, February 1973. 5 fig, 1 tab, 23 ref.

Descriptors: *Geochemistry, Water chemistry, *Trace elements, *Atlantic Ocean, *Tropic, Salinity, Water sampling.
Identifiers: USSR, *Arsenic, *Antimony.

As and Sb were determined by neutron-activation analysis in 173 water samples taken from the tropical Atlantic between December 1969 and March 1970. The mean concentrations of these elements were 4.5 and 0.5 micrograms/liter, respectively. Distribution of As and Sb is disproportionate to salinity; ratios of As and Sb concentrations (in g/liter) to salinity (in percent) range from 0.05 to 3.9 times 10 to the minus 7th power and from 0.2 to 3.3 times 10 to the minus 8th power, respectively. Nonuniform geographic and vertical distribution of these elements is determined to a considerable extent by the hydrologic structure of the tropical zone of the Atlantic. The concentration ratio for As and Sb in waters of the tropical Atlantic varies between 1.5 and 51. The mean value for the ratio is 9, which coincides with the ratio of these elements in the lithosphere and in seawater. (Josefson-USGS)
W74-06309

FLUORINE IN SOME NATURAL WATERS OF TADZHIKISTAN (FTOR V NEKOTORYKH PRIRODNYKH VODAKH TADZHIKISTANA),
Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Khimii.
D. L. Patina, and D. N. Pachadzhanov.
Geokhimiya, No 2, p 250-256, February 1973. 1 fig, 1 tab, 29 ref.

Descriptors: *Water chemistry, *Fluorine, *Fluorides, Rivers, *Reservoirs, Groundwater, Floodwater, Low flow, Salts.
Identifiers: *USSR(Tadzhikstan), Mineralization.

Fluoride concentrations in waters of most rivers and reservoirs in northern and western Tadzhikistan during floods range from 0.000013% to 0.000044%. The Kyzyl-Su and Tair-Su Rivers have high salt contents, and their fluoride concentrations (0.000132% to 0.00018%) are similar to those for rivers in Kazakhstan. The fluoride concentration in rivers and reservoirs of northern Tadzhikistan varies with the hydrological stages of the rivers; fluoride concentrations are lower during floods than during low-water periods by a factor of 2 or more. The fluoride concentration during low flow increases when the rivers are supplied by groundwater. A positive correlation is established between fluoride content and total mineralization for most water types examined. Fluoride contents of 13 rivers and 2 reservoirs in southwestern and

northern Tadzhikistan are tabulated. (Josefson-USGS)
W74-06310

CHEMISTRY OF SOME GROUND WATERS IN IGNEOUS ROCKS,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Land Improvement and Drainage.
G. Jacks.
Nordic Hydrology, Vol 4, No 4, p 207-236, 1973. 16 fig, 3 tab, 45 ref.

Descriptors: *Water chemistry, *Igneous rocks, *Weathering, Hydrogeology, Leaching, Clay minerals, Ion exchange, Sea water, Saline water intrusion, Engineering geology, Groundwater movement.
Identifiers: *Sweden.

The composition of groundwater from igneous rocks is governed by mineral-water equilibria. As these equilibria are established slowly, it is possible to roughly date the waters. It is possible to deduce what kind of clay minerals are encountered by the waters. The fact that montmorillonite is more common in Gothenburg than in Stockholm is nicely illustrated by such analyses. By means of water analyses from wells, it is possible to tell whether or not the clays would cause trouble when tunneling in the rock. Salty groundwaters retained from glacial time were found in Sweden. Sometimes this saltwater can be pumped away. Large local gradients in the groundwater table and permeable tectonic zones favor washing out of the old seawater. These old seawaters have a very specific character. Due to ion exchange they contain much Ca in contrast to fresh seawaters. This provides a means to distinguish them from fresh seawater which has invaded an aquifer due to pumping. (Knapp-USGS)
W74-06371

THE CONTENT OF SOME NATURAL RADIOACTIVE ELEMENTS, ESPECIALLY RN-222, IN SOME POTABLE WATERS IN SWEDEN,
National Inst. of Radiation Protection, Stockholm (Sweden).
J. O. Snihs.
Nordic Hydrology, Vol 4, No 4, p 256-274, 1973. 2 fig, 6 tab, 17 ref.

Descriptors: *Radioisotopes, *Groundwater, Water chemistry, *Water quality, Lead radioisotopes, Radioactivity, *Potable water.
Identifiers: *Sweden, *Radon-22, Polonium.

The content of Rn-222 in drinking water was measured in 118 wells in southeastern Sweden. Only bored wells and especially those in granite bedrock have randon contents which exceed 20 nCi/liter. Dug wells usually have low radon contents (< 2 nCi/liter). Wells on granite bedrock and in till have higher average radon contents than do others. Communal wells (each supplying water to more than 200 people) are most often dug in sand and gravel and can therefore be expected to contain low radon concentrations. The contents of Ra-226, Pb-210 and Po-210 in water from bored wells are low compared to Rn-222. There are no significant correlations between the contents of these nuclides or between their contents and the depths of the wells. The radiation from Rn-222 is completely dominant in comparison with the radiation of the other nuclides examined. Water with a radon content lower than about 100 nCi/liter does not contain Pb-210 and Po-210 of any significance. (Knapp-USGS)
W74-06372

WATER QUALITY REPORT, UPPER SNOQUALMIE RIVER SYSTEM, AUGUST 1972-NOVEMBER 1972,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 5B.
W74-06375

GEOHYDROLOGY OF ATCHISON COUNTY, NORTHEASTERN KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06376

NMR STUDIES OF WATER ADSORBED ON A NUMBER OF SILICA SURFACES,
Nottingham Univ. (England). Dept. of Physics.
R. T. Pearson, and W. Derbyshire.
Journal of Colloid and Interface Science, Vol 46, No 2, p 232-248, February 1974. 8 fig, 1 tab, 60 ref.

Descriptors: *Water structure, Water porperties, Ice, *Freezing, *Heavy water, *Adsorption, *Silica, Physical properties, Pore water, Porosity, Thermal properties, Soil physics, Porous media, Surfaces, *Nuclear magnetic resonance, Analytical techniques.

Broad-line and pulsed nuclear magnetic resonance techniques were applied between -196 and +30 C to examine the freezing of water and heavy water adsorbed at various regain values on four types of amorphous silica of differing surface characteristics. The appearance of two-phase behavior in spin-lattice and spin-spin relaxation processes and the proportion of nonfreezable water were studied as functions of surfaces pore size and BET monolayer coverage. On many samples hysteresis was observed in signal strength, line width, and T(2) relaxation time in the range from -20 to -50 C. Results favor an interpretation in terms of a model involving enhance structuring of unfrozen water inside small filled pores. Evidence is presented of progressive ice formation inside large filled pores and of rapid diffusional exchange in the unfrozen surface layer, both interpore and intrapore. (Brown-IPC)
W74-06405

CHEMICAL OCEANOGRAPHY OF THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W74-06428

THE EFFECTS OF RESTRICTED CIRCULATION ON THE SALT BALANCE OF GREAT SALT LAKE, UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2H.
W74-06435

WATER QUALITY EFFECTS OF SEEPAGE FROM EARTHEN DAMS,
Geological Survey, Prescott, Ariz.
For primary bibliographic entry see Field 5B.
W74-06453

FERRUGINOUS CONCRETIONS IN A POORLY DRAINED SOIL OF ALBERTA,
Alberta Univ., Edmonton.
For primary bibliographic entry see Field 2G.
W74-06485

EMISSION SPECTROMETRIC DETERMINATION OF ARSENIC,
Colorado State Univ., Fort Collins. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-06499

2L. Estuaries

NITROGEN BUDGET OF A NORTH CAROLINA ESTUARY,
North Carolina State Univ., Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-05954

MORGAN CITY PUBLIC HEARING TESTIMONY.
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
For primary bibliographic entry see Field 6E.
W74-05997

A PLANNING CONCEPT FOR THE GEORGIA COASTAL ZONE.
Georgia Univ., Athens. Special Task Force Committee.
September, 1972. 31 p, 4 append.

Descriptors: *Coasts, *Water resources development, *Water resources, *Research and development, *Project planning, *Georgia, Water conservation, Land conservation, Project purposes, Inter-agency cooperation, Administration, Coastal plains, Saline water intrusion, Recreation, Environment, Economics, Long-term planning.

An effort was made to formulate and propose an integrated concept for sound planning of the Georgia coastal zone. The special committee felt the coastal zone is in urgent need of unified planning and the report summarizes their conclusions. The introduction gives a background statement of Georgia's coastal zone, and some of the intrusions which infringe upon its resources. A concise definition of the coastal zone and a brief account of the resources are given and supplemented by additional material in the Appendix. In analyzing the status of the zone, key features of the economy were reviewed, and those aspects of the natural environment that merit consideration in the planning effort were identified. The planning concept itself was discussed, and the development of the plan is based upon three major considerations--the natural environment, citizen involvement, and legal precedents. The planning process called for two major action phases: the make-up of a planning team and a sequence of task assignments. The appendices further analyze the coastal zone, its status, the classification of coastal zone resources and the planning process. (Sutton-Florida)
W74-05998

LOUISIANA WETLANDS PROSPECTUS.
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
Final Report, September, 1973. 346 p, 32 fig, 13 map, 13 tab, 15 photo, 274 ref, 3 append.

Descriptors: *Water resources development, *Coasts, *Coastal marshes, *Water resources, *Land resources, Louisiana, Land use, Recreation, Water demand, Water quality control, Inter-agency cooperation, Ecology, Legal aspects, Publications, Water law, State governments, Planning, Project purpose, Estuary, Estuarine environment.

A workable coastal zone management program for Louisiana is discussed. Eleven subjects of coastal and marine resources management were considered. These included population growth and urbanization, land use, recreation, waste management, water quality, water and power development, transportation and trade, engineering and technology, marine science, research and education. Weather, climate and oceanographic conditions were monitored, socioeconomic and legal matters were also considered, as were federal plans for coastal zone management. These subjects were studied with a view toward meeting five objectives. Chapter One gives a summary of the Commission's work. Chapters Two through Four present an inventory on the state's coastal resources, trends in the use of them and a series of specific recommendations for planning and managing growth and conservation in a wetlands environment. Chapter Five gives the recommended legal and administrative framework and includes a draft statute. Chapter Six deals with critical questions surrounding ocean engineering

and development, research and education, recreation, culture and tourism and new technical developments. The Commission relied on research and studies already available in analyzing many issues and an appendix outlines some of these. (Sutton-Florida)
W74-06003

OFFSHORE MARINE ENVIRONMENT PROTECTION ACT OF 1973, FIRST SESSION ON S.80.
For primary bibliographic entry see Field 6E.
W74-06009

PROTECTING AMERICA'S ESTUARIES: FLORIDA.
For primary bibliographic entry see Field 5G.
W74-06010

UPTAKE AND ACCUMULATION OF AN ORGANOCHLORINE INSECTICIDE (DIELDRIN) BY AN ESTUARINE MOLLUSC, RANGIA CUNEATA,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-06031

BENTHIC FAUNA AND ZOOPLANKTON IN SOME POLLUTED SWEDISH ESTUARIES,
Uppsala Univ. (Sweden). Inst. of Zoology.
For primary bibliographic entry see Field 5C.
W74-06043

ACCUMULATION AND MOVEMENT OF MIREX IN SELECTED ESTUARIES OF SOUTH CAROLINA, 1969-71,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab.
For primary bibliographic entry see Field 5B.
W74-06054

GUIDE TO IDENTITY OF EGGS AND LARVAE OF SOME GULF OF MEXICO CLUPEID FISHES,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
E. D. Houde, and P. L. Fore.
Available from the National Technical Information Service as COM-73-11418 $3.00 in paper copy; $1.45 in microfiche. Report No NOAA-73 81602, April 1973. 14 p, 4 fig, 2 tab, 32 ref. Contract No NOAA-2-35147.

Descriptors: *Marine fish, *Fish eggs, *Fish taxonomy, *Larvae, *Gulf of Mexico, *Herrings, Animal groupings, Fish reproduction, Spawning, Life history studies.
Identifiers: Gulf menhaden, Thread herring, Spanish sardine, Round herring, Scaled sardine, Dwarf herring, Yellowfin menhaden, Finescale menhaden, Orangespot sardine.

Descriptions of eggs and larvae of Harengula pensacolae, Brevoortia spp., Etrumeues teres, Opisthonema oglinum, and Sardinella spp. are given based on examination of specimens from the Gulf of Mexico, from laboratory rearing experiments, and from reports in the literature. A key to larvae is presented, primarily for identifying specimens longer than 15 mm standard length, but usually providing identification for much smaller specimens. A brief review of pertinent literature is included. (Holoman-Battelle)
W74-06067

BENTHIC OXYGEN DEMANDS OF HOUSTON SHIP CHANNEL SEDIMENTS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W74-06073

ECOLOGY OF SMALL BOAT MARINAS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W74-06074

NUTRIENT-PRODUCTIVITY RELATIONSHIPS IN A BAYOU ESTUARY,
General Electric Co., Bay Saint Louis, Miss. Mississippi Test Support Dept.
For primary bibliographic entry see Field 5C.
W74-06160

A BILL TO AMEND THE ACT OF AUGUST 3, 1968, RELATING TO THE NATION'S ESTUARIES AND THEIR NATURAL RESOURCES, TO ESTABLISH A NATIONAL POLICY WITH RESPECT TO THE NATION'S BEACH RESOURCES.
For primary bibliographic entry see Field 6E.
W74-06177

RESEARCH AND DEVELOPMENT.
For primary bibliographic entry see Field 6E.
W74-06193

A BACTERIOLOGICAL STUDY OF THE OYSTER BEDS AND SHELLFISH OF THE LAGOON OF OUALIDIA DURING 1970, (IN FRENCH),
Institut des Peches Maritimes du Maroc, Casablanca.
For primary bibliographic entry see Field 5C.
W74-06252

PRELIMINARY INVESTIGATIONS OF AN INTERTIDAL SAND BODY, COBEQUID BAY, BAY OF FUNDY,
McMaster Univ., Hamilton (Ontario). Dept. of Geology.
R. W. Dalrymple.
Maritime Sediments, Vol 9, No 1, p 21-28, April 1973. 6 fig, 5 ref.

Descriptors: *Sedimentary structures, *Sand bars, *Ripple marks, *Tides, *Canada, Currents(Water), Bores, Sediment transport, Intertidal areas, Bays.
Identifiers: *Bay of Fundy, Cobequid Bay.

The highest recorded tidal range in the world, 55 ft., was measured off Burntcoat Head in Cobequid Bay, Nova Scotia, Canada. At low tide, an extensive complex of sand bars is exposed. At high tide, these sand bodies are covered by several tens of feet of water. Thus, the results of processes operating at depths otherwise virtually inaccessible are easily available for study, modified by those features attributable to emergence. Selmah bar appears to be in dynamic equilibrium. Megaripple slip face orientations yield a strongly bimodal distribution. Thus, depending on the preservation of cross-stratification, cross-bedding might be expected to exhibit the same bimodal distribution with the maxima 180 deg apart. Tidal current time-velocity asymmetry is a pervasive factor in the study of intertidal or tidal environments and determines the dominant direction of sediment transport. The pattern of sediment transport due to tidal currents is disrupted to a considerable extent by open-channel flow immediately before and during exposure, resulting in a complex transport system. The plan form of megaripples results from a complex interplay of current velocity, bedload, water depth, length of time for development and the uniformity of current direction. Megaripple amplitude and wavelength are strongly influenced by current velocity and water depth, and possibly by grain size. (Knapp-USGS)
W74-06260

FLOOD PRONE AREAS IN THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W74-06275

SEDIMENTARY REFLECTION OF DEPOSITIONAL ENVIRONMENT IN THE BARDAWIL LAGOON, NORTHERN SINAI,
Geological Survey of Israel, Jerusalem. Marine Geology Div.
Y. Levy.
Journal of Sedimentary Petrology, Vol 44, No 1, p 219-227, March 1974. 6 fig, 1 tab, 19 ref.

Descriptors: *Sedimentation, *Provenance, *Water chemistry, *Lagoons, Deposition(Sediments), Carbonates, Gypsum, Evaporation, Sands, Clays, Salinity, Brines, Littoral drift, Barrier islands.
Identifiers: *Mediterranean, *Sinai region.

Bardawil lagoon in the northern Sinai is separated from the Mediterranean by a sand barrier. The decrease in specific alkalinity of the waters with increasing distance from the inlets and with increasing chlorosity suggest that authigenetic carbonates are precipitating at present from the lagoon waters. The predominant type of sediment is sand, covering all the nearshore and nearbar areas; clayey sand covers the deepest and the most distant parts from the inlets, which connect the lagoon with the Mediterranean. The western-arm sediments, composed of sand containing marine diatoms and pelecypods, show that the region was under marine conditions throughout the period represented by the column of sediments studied. In the main lagoon a change from marine conditions, represented by sand and marine shells found in the deeper portions of the cores to lagoonal evaporitic ones in the upper sediments (gypsum and clayey sediments present) is clearly demonstrated. At present the salinity of the lagoon waters does not permit the precipitation of gypsum. The relative abundance of the sand, the spatial distribution of gypsum and marine and lagoonal diatoms suggest that the sedimentary column studied was formed under marine to lagoonal conditions and that no streams entered the lagoon during this period. The sediments were brought to the lagoon from the Mediterranean. The Nile branches (including the Pelusiac) brought the sediments to the Gulf of El Tina in the Mediterranean, and longshore west-east currents brought the sediments to the lagoon. (Knapp-USGS)
W74-06283

ENVIRONMENT, WATER AND SEDIMENTS OF CHRISTIANSTED HARBOR, ST. CROIX,
Caribbean Research Inst., St. Thomas, Virgin Islands.
For primary bibliographic entry see Field 5C.
W74-06292

SURFACE OBSERVATIONS, GROUND TRUTH AND DATA, NASA-USGS MISSION 144, CHESAPEAKE BAY REGION, SEPT. 22-30, 1970,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5A.
W74-06300

THE COMPUTATION OF TIDES AND CURRENTS IN ESTUARIES AND CANALS: APPENDIX A: A USER'S MANUAL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. R. F. Harleman, and M. L. Thatcher.
Available from NTIS as AD-762 613 for $3.00 in paper copy. Technical Bulletin No 16, Appendix A, Prepared for Committe of Tidal Hydraulics, June 1973. 122 p, 10 fig, 7 tab, 8 ref, 2 addendum. DA-22-079-CIVENG-65-20.

Descriptors: Mathematical models, *Estuaries, *Computer programs, *Canals, Tides, Currents(Water), Sea level, *Data processing.
Identifiers: *Boundary conditions, *Embayments, Panama Canal, Delaware River Estuary.

This User's Manual is issued as an appendix to Technical Bulletin No. 16 (W73-12428) entitled 'The Computation of Tides and Currents in Estuaries and Canals.' The mathematical model consists of the one-dimensional continuity and momentum equations applicable to variable area estuaries, embayments, or sea-level canals. The equations are solved simultaneously by means of an explicit finite-difference scheme to yield values of tidal elevation and discharge along the longitudinal axis of the waterway. The three original programs have been modified and combined into a single computer program in which the user specifies the boundary conditions appropriate to the type of estuary, embayment, or canal under consideration. The procedures for geometric schematization of a tidal waterway are outlined and guidelines for the choice of Delta x and Delta t are given. The general structure of the computer program is described and detailed instructions are given for input data and format. Two test cases are presented to document the use of the computer program and to furnish the user with a basis of comparison. The first test case is a closed-end estuary (the Delaware) and the second is a proposed route for a sea-level canal (Panama). Complete listing of the input and output for the test cases are given. A plotting program for the graphical display of time varying tidal elevations and discharges at selected longitudinal stations is given. The computer program contains built-in checks on certain logic conditions; these are discussed as well as possible error messages which may result from inadvertent omissions. The final section contains hints for modifying the program and a discussion of its implementation on different computer systems. (Sinha - OEIS)
W74-06312

A PACKAGE PROGRAM FOR TIME-STEPPING LONG WAVES INTO COASTAL REGIONS WITH APPLICATION TO HALEIWA HARBOR, OAHU,
Hawaii Inst. of Geophysics, Honolulu; and National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
H. G. Loomis.
Available from NTIS as COM 73-10596 for $3.00 in paper copy. Report No HIG 72-21 and NOAA JTRE-79, October 1972. 33 p, 15 fig, 4 ref, 2 append. NOAA.

Descriptors: Hawaii, *Computer programs, Harbors, *Shallow water, *Coasts, Bays, Bathymetry, *Waves(Water).
Identifiers: *Long waves, Hydrodynamic equations.

A method is described for time-stepping a long wave of any predetermined description and direction of arrival into a harbor, bay, or other coastal region. Long-wave, shallow-water equations are used. Information is given on the considerations involved in the construction of a computer code and of the code itself, and instructions are given on how to use the code. An example of time-stepping a wave into Haleiwa Harbor and listing of computer programs are appended. (Sinha - OEIS)
W74-06316

SHALLOW WATER EXPERIMENT UTILIZING THE STD MODEL 9006 AT A FIXED POINT,
Naval Postgraduate School, Monterey, Calif.
W. J. Frigge.
Available from NTIS as AD-769 408 for $6.25 in paper copy. Master's thesis, March 1973. 79 p, 5 fig, 7 tab, 11 ref, 4 append.

Descriptors: California, *Salinity, Shallow water, *Instrumentation, *Computer programs, Measurement.
Identifiers: *STD Model 9006.

The salinity sensing capabilities of the STD Model 9006 were examined in laboratory and in shallow water field conditions both in Monterey Bay and at the N.U.C. Tower off Mission Beach at San Diego, California. Laboratory studies showed it to be influenced by changes in water velocity from zero to non-zero. Field studies showed that the instrument was unsuitable for sensing instantaneous microstructure fluctuations of salinity in shallow water while being held at a single depth in a wave influenced regime. Averaged over a period of ten seconds or more, however, the output of the instrument was judged to be accurate to at least the first decimal place. (Sinha - OEIS)
W74-06317

A NEW METHOD FOR DETERMINING NORMAL MODES OF IRREGULAR BODIES OF WATER WITH VARIABLE DEPTH,
Hawaii Inst. of Geophysics, Honolulu; and National Oceanic and Atmospheric Administration, Honolulu, Hawaii. Joint Tsunami Research Effort.
H. G. Loomis.
Available from NTIS as PB-224 613, PB-224 516 for $4.00 in paper copy. Prepared for National Science Foundation, International Decade of Ocean Exploration, HIG-73-10, NOAA-JTRE-86,/June 1973. 27 p, 8 fig, 4 tab, 3 ref. NSF AG-253.

Descriptors: *Shallow water, *Waves(Water), Equations, *Computer programs, Bays, Oceans, Tsunamis.
Identifiers: Difference equations.

This report supersedes one by Loomis (A Method of Setting Up the Eigenvalue Program for the Linear, Shallow-Water-Wave Equation for Irregular Bodies of Water with Variable Water Depth and Application to Bays and Harbors in Hawaii, Hawaii Inst. of Geophysics Rept. HIG-70-32, Univ. of Hawaii, Honolulu, 1970) on finding normal modes of irregular bodies of water with variable depth. The present method ensures that the matrix corresponding to the differential operator is symmetric, guaranteeing that eigenvalues are real and allowing use of the many available computing techniques suitable for symmetric matrices. Also, only half the matrix need be stored, thereby saving on storage space. The boundary conditions Phi = O or Phi sub n = O are satisfied in a natural way without the assignment of grid points outside the boundaries of the water, as was necessary previously. The numerical code comes in a neat package, to which the user need add only the bathymetry of the water (with water depths of zero assigned at land areas) and certain parameters of the grid, and specify the type of output desired. An additional output possible from the code is a contour map of the normal modes. (Sinha - OEIS)
W74-06318

ENVIRONMENTAL LAW--ZONING--ORDINANCE PROHIBITING FILLING WETLANDS ADJACENT TO NAVIGABLE WATERS WITHOUT PERMIT IS CONSTITUTIONAL EXERCISE OF POLICE POWER NOT REQUIRING PAYMENT OF COMPENSATION.
For primary bibliographic entry see Field 6E.
W74-06331

THEORY, DEVELOPMENT, AND UTILIZATION POTENTIAL OF THE BIOMILIEU CONCEPT,
Army Engineer District, Chicago, Ill.
I. J. Szekelyhidi.
Water Resources Bulletin, Vol 8, No 1, p 24-37, February, 1972. 11 fig, 6 ref.

Descriptors: *Bioindicators, *Biorhythms, *Ecology, Soil, Management, Environment, Biological communities, Computers, Computer models, Cost-benefit analysis, *Estuarine environment.
Identifiers: *Biomilieu Theory, *Biomilieu index, Environmental quality index, Biocatalytic.

A quantitive engineering approach to analysis of total environment allowing for simultaneous consideration of a theoretically infinite number of quality indicators and physiological requirements is presented. Theory and fundamentals of a two-dimensional space and time function solution concerning a small estuarine-type environment are discussed. A three-dimensional solution is indicated. Input data may range from reconnaissance-type to the outputs of mathematical transport models. Applications are discussed with respect to environmental quality problems, availability of suitable data, and some areas of research where results could find immediate application. (Skogerboe-Colorado State)
W74-06332

ELECTRICAL ANALOG MODEL STUDY OF THE ALLUVIAL AQUIFER IN THE YABUCOA VALLEY, PUERTO RICO: PHASE 2--THE PLANNING, CONSTRUCTION AND USE OF THE MODEL,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 2F.
W74-06351

NUTRIENT ENRICHMENT AND CONTROL REQUIREMENTS IN THE UPPER CHESAPEAKE BAY, SUMMARY AND CONCLUSIONS,
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 5C.
W74-06352

SPAWNING, LARVAL SETTLEMENT, GROWTH, BIOMASS, AND DISTRIBUTION OF CIONA INTESTINALIS L. (TUNICATA) IN BORGENFJORDEN, NORTH-TRONDELAG, NORWAY,
B. Gulliksen.
Sarsia. 51, p 83-96. 1972. Illus.
Identifiers: Biomass, *Ciona-intestinalis, Distribution, Growth, Larval settlement, *Norway(Borgenfjorden), Spawning, *Tunicata(Larvae).

Spawning, larval settlement, growth, variation of biomass, and distribution of C. intestinalis in Borgenfjorden were investigated using submerged slabs of eternite and line transects. In 1970, the spawning started at a temperature between 8C-12C in May-June and continued to Aug.-Oct. with main settlement on the bottom in June. Settling was also observed during the winter, but these larvae were probably recruited from populations outside Borgenfjorden. The highest values of biomass on the line transects were observed from Aug.-Nov. on hard-bottom localities in outer Borgenfjorden. The biomass per m2 was larger on the enternite slabs than in the line transects, mainly due to heavy predation both on larvae and adult C. intestinalis on the line transects.--Copyright 1973, Biological Abstracts, Inc.
W74-06417

THE HYDROLOGICAL EVALUATION OF REGIONAL WATER-RESOURCE SYSTEMS IN THE UNITED KINGDOM,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 6B.
W74-06421

A REVIEW OF THE OCEANOGRAPHY AND RENEWABLE RESOURCES OF THE NORTHERN GULF OF ALASKA.
Alaska Univ., College. Inst. of Marine Science.
IMS Report R72-23 (Sea Grant Report 73-3), February 1972. 690 p. NOAA Grant 04-3-158-41.

Descriptors: *Oceanography, *Reviews, *Pacific Ocean, *Alaska, *Continental shelf, Water circulation, Ocean currents, Fisheries, Water chemistry, Sedimentation, Hydrology, Glaciology, Water pollution, Oil pollution.
Identifiers: *Gulf of Alaska.

The first oceanographic observation in the northern Gulf of Alaska were made by Captain Cook in 1778. Although many cruises of exploration and commercial exploitation took place in the years that followed, it was not until the late 1920's that full-scale oceanographic observations. Routine sampling of the Gulf of Alaska did not start again until after the end of the Second World War. Even with the increased emphasis on oceanography in the late 1950's, observation in the northern Gulf of Alaska can at best be described as spotted. This lack of information can be ascribed to unfavorable weather conditions and distance from the major oceanographic centers. The coastal area of the northeastern Gulf of Alaska is characterized topographically by a relatively straight coastline and by extensive coastal lowlands. This is in contrast to elsewhere in the Gulf of Alaska where the coastline is extremely irregular and the mountains rise abruptly from the shore. The coastal lowlands extend inland 2 to 40 miles to the southern front of the Chugach and St. Elias Mountains. Despite the relatively mild climate at sea level in this region, about one-fifth of the coastal land is covered by glaciers or by permanent ice and snow fields. The continental shelf varies in width from a maximum of 60 miles off Prince William Sound to a minimum of 7 miles off Cape Suckling just east of Kayak Island. In general, the shelf is marked by irregular topography resulting from its past glacial history. This is a broad review of the present state of knowledge of the oceanography and renewable marine resources of the Gulf of Alaska. It is the most complete collection of Gulf of Alaska environmental and renewable source data which has been assembled to data. (See W74-06427 thru W74-06434) (Knapp-USGS)
W74-06426

PHYSICAL OCEANOGRAPHY OF THE NORTHERN GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
T. C. Royer.
In: A Review of the Oceanography and Renewable Resources of the Northern Gulf of Alaska: Alaska University Institute of Marine Science Report R72-23 (Sea Grant Report 73-3), Section 1. p 5-22, February 1972. 7 fig, 1 tab, 33 ref. NOAA Grant 04-3-158-41.

Descriptors: *Oceanography, *Alaska, *Continental shelf, *Reviews, Currents(Water), Mixing, Water circulation, Ocean currents, Water temperature.
Identifiers: *Gulf of Alaska.

Research in the field of physical oceanography in the Gulf of Alaska is reviewed. It covers a time span of about 45 years. However, the duration is deceptive since the number of oceanographic expeditions tend to be grouped in the summer months to take advantage of favorable climatic conditions. Most investigations were undertaken with the purpose of providing data to assist in the evaluation of the fisheries of the region. Recent studies are generally more concerned with providing data basic for the understanding of the entire air-sea system. Description of the physical oceanographic parameters in the North Pacific yields little insight into the short-term variation of conditions on the shelf region in the Gulf of Alaska. The air-sea interaction on the shelf apparently modifies the oceanographic parameters to a large extent making it necessary to have data on the local effects before a complete understanding of the local dynamics can be accomplished. Winter convective mixing extends to the ocean bottom on the continental shelf. The minimum water temperature in the region is about 1C colder than the previously reported low of 2.78C. It appears that the bottom of the halocline extends partially onto the shelf region, which indicates that the outer part of the shelf does not have season water-mass fluctuations as a result of convective cooling. (See also W74-06426) (Knapp-USGS)
W74-06427

CHEMICAL OCEANOGRAPHY OF THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
L. Longerich, and D. W. Hood.
In: A Review of the Oceanography and Renewable Resources of the Northern Gulf of Alaska: Alaska University Institute of Marine Science Report R72-23 (Sea Grant Report 73-3), Section 2, p 23-55, February 1972. 18 fig, 3 tab, 37 ref. NOAA Grant 04-3-158-41.

Descriptors: *Water chemistry, *Alaska, *Continental shelf, *Reviews, *Oceanography, Trace elements, Nutrients.
Identifiers: *Gulf of Alaska.

The chemical data available for the Gulf of Alaska, particularly the near-coastal area, are limited and very sporadic. These consist largely of short-term observations of the concentration of some of the chemical parameters in the area with no information on the seasonal effects or on the dynamic processes w which control these concentrations. In the northern Gulf of Alaska in the area inside the 200-meter depth profile and between Cross Sound and Kodiak Island, only limited chemical information is available. Inorganic nutrients have been the only chemical parameters measured in this region except for a brief study near Kodiak Island in June 1967. Although there has been a considerable number of measurements of hydrography and nutrients in the Gulf of Alaska and the North Pacific Ocean area, few actual stations were occupied on the continental shelf. (See also W74-06426) (Knapp-USGS)
W74-06428

A REVIEW OF THE BIOLOGICAL OCEANOGRAPHY OF THE NORTHEAST PACIFIC OCEAN,
Alaska Univ., College. Inst. of Marine Science.
R. T. Cooney.
In: A Review of the Oceanography and Renewable Resources of the Northern Gulf of Alaska: Alaska University Institute of Marine Science Report R72-23 (Sea Grant Report 73-3), Section 3, p 57-74, February 1972. 3 fig, 2 tab, 53 ref. NOAA Grant 04-3-158-41.

Descriptors: *Oceanography, *Pacific Ocean, *Arctic, *Productivity, Primary productivity, Systematics, Plankton, Benthos, Continental shelf, Currents(Water), *Reviews, Ocean currents.
Identifiers: Biological oceanography, Gulf of Alaska.

Since geostrophic circulation near the northern shelf of the northeast Pacific would seem to preclude any large-scale upwelling from depth, the general level of coastal photosynthesis should not exceed that of the open ocean by more than a factor of three. In the absence of large numbers of interzonal grazers, a typical spring 'bloom' is likely, with production beginning over the shelf as early as March. The species composition and successional phenomena in the seasonally developing plankton community should reflect more the neritic character of the coastal zone than that of the open ocean, particularly during the time of maximum runoff; pelagic larvae and juveniles of benthic populations, the temporary zooplankton, would be expected in much greater abundance here than in the central Gulf of Alaska. (See also W74-06426) (Knapp-USGS)
W74-06429

THE INTERTIDAL REGION OF THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
H. M. Feder, and G. Mueller.
In: A Review of the Oceanography and Renewable Resources of the Northern Gulf of Alaska: Alaska University Institute of Marine Science Report R72-23 (Sea Grant Report 73-3), Section 4, p 75-130, February 1972. 8 fig, 1 tab, 179 ref. NOAA Grant 04-3-158-41.

Descriptors: *Oceanography, *Pacific Ocean, *Arctic, *Productivity, Primary productivity, Systematics, Plankton, Benthos, Continental shelf, Currents(Water), *Reviews, Ocean currents.
Identifiers: Biological oceanography, *Gulf of Alaska.

Review of the biological literature indicates that basic information on trophic relationships for coastal littoral communities of the Gulf of Alaska is limited. The rugged coastline of the Gulf of Alaska is not well known, and very few of its shores have been described sufficiently to be of any correlative value to ecological studies on them. However, some rocky and sandy shores from Amchitka Island to Yakutat Bay have been described in varying detail. The region of Controller Bay from the edge of the Copper River Delta to the Bering Glacier (about 28 miles) is known to be a region of oil seepage, and oil on beaches near these seeps has been described. The taxonomy of the following groups in the Gulf of Alaska is relatively well understood: Annelida (Polychaeta), Arthropoda (Crustacea), Mollusca, Echinodermata (Asteroidea and Ophiuroidea), Chordata (Fishes). The Gulf of Alaska can be divided into two distinct floristic regions: (1) a northern coastal region from northern Washington to Yakutat and (2) a western region from Kodiak Island to Attu Island. The two regions overlap and show a transition between the two floras. The flora of the northern region is well known but not complete. The western region is much less known with little published work on flora here. The transition region is little known, and no survey work has been published. Ecologically oriented research includes a survey of Three Saints Bay, Kodiak Island, a study in Prince William Sound which was initiated immediately after the 1964 Alaska earthquake to assess changes in the intertidal region; and a study in the vicinity of the test site on Amchitka Island. The ecological information from the three study sites was not directly comparable since the regions were quite different in physical environmental features. (See also W74-06426) (Knapp-USGS)
W74-06430

COASTAL WEATHER, TIDES AND WIND WAVES OF THE NORTHERN GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
D. H. Rosenberg.
In: A Review of the Oceanography and Renewable Resources of the Northern Gulf of Alaska: Alaska University Institute of Marine Science Report R72-23 (Sea Grant Report 73-3), Section 5, p 131-141, February 1972. 6 fig, 1 tab, 4 ref. NOAA Grant 04-3-158-41.

Descriptors: *Pacific Ocean, *Arctic, *Weather data, *Tides, *Waves(Water), Reviews, Climatic data, Wind tides.
Identifiers: *Gulf of Alaska, Wind waves.

The coastal weather, tides and wind waves of the northern Gulf of Alaska are reviewed. The climate along the rim of the Gulf of Alaska is definitely

marine. In the winter, the water is much warmer than the air, while in the summer the air is warmer than the water. This results in mild winters and cool summers. Winter winds are predominantly easterly in the northern Gulf. Summer winds are influenced by the North Pacific High which causes winds along the Alaskan coast to be generally light and variable. The tides along the northeastern Gulf of Alaska are semidiurnal in nature with a marked inequality between successive low waters. The mean diurnal range varies from 10.1 feet at Yakutat to 10.6 feet at Seward. Middleton Island has a diurnal range of 10.3 feet. In general, the wind waves in the northeastern Gulf of Alaska are less than 12 feet high. Very severe storms that have generated waves as high as 40 feet occur in the Gulf of Alaska. (See also W74-06426) (Knapp-USGS)
W74-06431

OIL AND GAS SEEPS OF THE NORTHERN GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W74-06432

THE LAND HYDROLOGY OF THE SOUTH-CENTRAL COASTAL ZONE,
Alaska Univ., College. Inst. of Water Resources.
R. F. Carlson.
In: A Review of the Oceanography and Renewable Resources of the Northern Gulf of Alaska: Alaska University Institute of Marine Science Report R72-23 (Sea Grant Report 73-3), Section 7, p 149-152, February 1972. 3 ref. NOAA Grant 04-3-158-41.

Descriptors: *Hydrology, *Runoff, *Sediment yield, *Alaska, *Reviews, Streamflow, Hydrologic data, Glaciers.
Identifiers: *Gulf of Alaska.

The most significant aspect of the hydrologic system of Alaska's south-central region, an area of some 100,000 sq mi, is the tremendous variety which occurs within this zone. There are few places in the United States which represent a greater variety of temperature, streamflow, and precipitation extremes within an area of this size. The region is characterized by a brief summer runoff season, a great number and volume of glaciers, a large volume of silt discharge in the streams during the summertime, and large elevation differences. Only limited hydrological studies have been made in this area. There exist only some eighty climatological stations in this region (IATCA, 1970). These stations are confined primarily to lower elevations along the sea coast and the river valleys. (See also W74-06426) (Knapp-USGS)
W74-06433

GEOLOGY AND GEOMORPHOLOGY OF THE CENTRAL GULF OF ALASKA CONTINENTAL SHELF,
Alaska Univ., College. Inst. of Marine Science.
F. F. Wright.
In: A Review of the Oceanography and Renewable Resources of the Northern Gulf of Alaska: Alaska University Institute of Marine Science Report R72-23 (Sea Grant Report 73-3), Section 8, p 153-160, February 1972. 1 fig, 35 ref. NOAA Grant 04-3-158-41.

Descriptors: *Geology, *Geomorphology, *Sedimentation, *Glaciation, *Alaska, Reviews.
Identifiers: *Gulf of Alaska.

The continental margin of the Gulf of Alaska reflects the complex recent orogenic and climatic history of the northernmost Pacific area. The region of particular interest lies between Kodiak Island and Yakutat Bay, an area which actually represents the seaward expression of a bight, where the entire North American cordillera has been deflected at least 90 deg close to the eastern end of the Aleutian arc and trench system. Tectonic mechanisms in the general area remain to be defined, but proponents of crustal-plate tectonic hypotheses have suggested that the current cycle of orogenic activity may be related to the opening of the Gulf of California and the resulting strong relative movement between the Pacific and American plates. There has been significant glaciation in the hinterland of the Gulf of Alaska for at least the past three million years. The combination of tectonism and intense glaciation has resulted in a very complex recent geologic history for the central Gulf of Alaska continental shelf region. (Knapp-USGS)
W74-06434

TROPIC ANALYSES OF AN ESTUARINE MANGROVE COMMUNITY,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
W. E. Odum, and E. J. Heald.
Bull Mar Sci. Vol 22, No 3, p 671-738, 1972. Illus.
Identifiers: Birds, Energy balance, *Estuarine environment, Fish food, *Florida(North River basin), Invertebrates, *Mangroves, *Trophic analysis.

Fringing the southwest coast of Florida is a mangrove belt which supports large populations of birds, gamefishes, and invertebrate species of commercial importance. A study was conducted between 1967 and 1969 in the North River basin of this mangrove region to determine the energy basis for this large population of animals and to delineate the routes by which energy is transferred through the food web. This is the first of 3 publications summarizing the results of this study. Summaries of food habits for most of the fish and aquatic invertebrate species which occur in the North River mangrove ecosystem are given. In addition to 10,000 analyses of stomach contents, information from other publications has been summarized where pertinent. Finally, for most species there is an estimate of relative importance in the North River system in terms of abundance.--Copyright 1973, Biological Abstracts, Inc.
W74-06489

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

DESALTED SEAWATER FOR AGRICULTURE: IT IS ECONOMICAL,
Resources for the Future, Washington, D.C.
M. Clawson, H. H. Landsberg, and L. T. Alexander.
In: Coastal Deserts, their human and natural environments, ed. by D.H.K. Amiran and A. W. Wilson, University of Arizona Press, Tucson, 1973. p 45-54, 19 ref.

Descriptors: *Desalination, *Sea water, *Comparative costs, *Irrigation water, *Nuclear powerplants, Desalination processes, Byproducts, Desalination wastes, Nuclear reactors, Treatment facilities, Desalting plants, Water sources, Brackish water, Water delivery, Water distribution(Applied).
Identifiers: *Middle East, Nuclear desalination.

Desalination has been actively suggested as a solution for the water shortage problem in agriculture for coastal deserts in recent years. The principal area of concern has been the Middle East. Although any desalination system requires an energy source, a process and a transportation system, and many of such systems are available, nuclear dual-purpose generator-desalination facilities are discussed in particular. Performance of such a plant, capital availability and costs, and operational costs are discussed in the economics of the process. Thermal and salinity environmental effects are considered, as are the nuclear accident possibilities, additional environmental considerations for a plant of this type. Transportation of the desalted water to the irrigation site is one of the most important and least considered elements in the utilization of nuclear desalting for agriculture. Pumping costs, capital outlay for pipeline, conveyance losses, and distribution systems are all elements of this consideration. The value of the irrigation water made available by desalination is dependent on the effectiveness of the agricultural plan in which the water is put to use. This is now, and appears to be for some time, far below the cost of obtaining the water by nuclear desalination. (Muller-Arizona)
W74-06467

PLASTIC OASES FOR ARID SEASHORES,
Arizona Univ., Tucson. Environmental Research Lab.
C. N. Hodges, M. H. Jensen, and C. O. Hodge.
In: Coastal Deserts, their natural and human environments, ed. by D.H.K. Amiran and A.W. Wilson, Univ. of Arizona Press, Tucson, 1973. p 55-61, 3 fig, 5 tab, 10 ref.

Descriptors: *Greenhouses, *Desalination, *Vegetable crops, *Coasts, *Agricultural engineering, Plastics, Arid lands, Irrigation, Water sources, Structures, Environment, Growth chambers, Arid climates, Sands, Deserts.
Identifiers: *Sonoran desert, Gulf of California.

Desalination of sea water along coastal deserts may be one solution to the need for increased supplies of fresh water for certain agricultural crops. Experimentation for over a decade on the arid Sonoran coast of the Gulf of California has succeeded in providing a prototype of power/water/food facility that uses the waste heat from the desalination process to heat the plastic greenhouses that are producing phenomenal vegetable crops for several commercial undertakings. The utilization of local sand as growing medium, humidification, fertilization and nutrient distribution, and plant breeding have all been elements in the studies. Squash, peppers, okra, beans, eggplant, lettuce, radishes, tomatoes, and cucumbers have been successfully cultivated in these inflated greenhouses with yields much greater and with longer growing seasons that comparable field crops. The Abu Dhabi facility on the Persian Gulf has proved to be a dependable supplier of fresh vegetables to a large population. These manmade oases also have future applications in the cultivation of grain crops such as rice or wheat in arid regions. (Muller-Arizona)
W74-06468

3B. Water Yield Improvement

SIXTH ANNUAL SURVEY REPORT ON THE AIR WEATHER SERVICE WEATHER MODIFICATION PROGRAM (FY 1973),
H. A. Chary, T. S. Cress, R. L. Lininger, and K. M. Weickmann.
Available from NTIS, Springfield, Va. 22151 as AWS-TR-73-251. Price $3.00 printed copy; $1.45 microfiche. Air Force Air Weather Service (MAC) Technical Report 73-251, October 1973. 22 p, 4 fig, 6 tab, 10 ref.

Descriptors: *Weather modification, *Fog, Ice fog, Cloud seeding, Research and development.
Identifiers: *Fog dissipation(Artificial), *Fog dispersal.

During FY 73 USAF Air Weather Service carried out six field projects--four to dissipate supercooled fog, and one each to dissipate warm and ice fog. In addition, cold fog was routinely and operationally dissipated at Fairchild AFB, Washington. The propane system installed at Elmendorf AFB,

Alaska, last year underwent its first season of testing. Airborne seeding with dry ice was available for European use. Such seeding was used for a period at Elmendorf AFB, but was not needed in Europe. A test was made of helicopter downwash and hygroscopic seeding for clearing warm fog. Dissipation of ice fog at Eielson AFB was attempted. A brief description of the procedures, equipment, and results of the tests is given. (Knapp-USGS)
W74-06356

IMPACTS OF INDUCED RAINFALL ON THE GREAT PLAINS OF MONTANA.
Montana State Univ., Bozeman.
Montana Agricultural Experiment Station Bulletin 670 (Final contract report), August 1973. 58 p, 6 fig, 2 tab. USBR Contract 14-06-D-7171.

Descriptors: *Cloud seeding, *Weather modification, *Montana, Ecology, Social impact, Agriculture, Crop production, Economic impact, Political aspects, Grasslands, Grazing, Wildlife.

Potential impacts of a successful program of weather modification in Montana wherein rainfall is increased were evaluated. Areas investigated include agriculture, ecology, sociology, economics and hydrology. Historical data include range and crop yield, weather, animal growth, soil and range surveys, research results and related research projects. Generally the impacts on agriculture have been positive varying with the timeliness of increased precipitation. Economic impacts have also been favorable indicating increased revenue from increased crop and range yields. Opinion questionnaires indicate a considerable gap in understanding by potential users, as well as wide range of reactions to cloud seeding. Possible problems which may result from weather modification are pointed out. (See W74-06443 thru W74-06447). (Knapp-USGS)
W74-06442

ECOLOGICAL IMPACTS: PART 1--RANGE AND RANGE LIVESTOCK PRODUCTION,
Montana State Univ., Bozeman. Dept. of Animal and Range Sciences.
W. G. Ballard, and D. E. Ryerson.
In: Impacts of Induced Rainfall on the Great Plains of Montana: Montana Agricultural Experiment Station Bulletin 670 (Final contract report), P 9-12, August 1973. USBR Contract 14-06-D-7171.

Descriptors: *Cloud seeding, *Weather modification, *Montana, *Forage grasses, Ecology, Social impact, Agriculture, Crop production, Economic impact, Political aspects, Grasslands, Grazing, Wildlife.

Increased precipitation resulting from weather modification will probably have a significant effect on range forage production only when combined with good livestock and grazing management practices. There may be a change in species dominants in plant communities found in vegetational types, but a drastic shift in vegetational types in the plains area of Montana is not expected. An increase in precipitation due to weather modification will result in increased weed growth and infestations. On ranges in good condition or better and under moderate grazing use, an increase in precipitation apparently does not affect cattle weight gains. (See also W74-06442) (Knapp-USGS)
W74-06443

ECOLOGICAL IMPACTS: PART II--WILDLIFE AND BIOCOMMUNITIES,
Montana State Univ., Bozeman. Dept. of Animal and Range Sciences.
J. J. Grensten, and D. E. Ryerson.
In: Impacts of Induced Rainfall on the Great Plains of Montana: Montana Agricultural Experiment Station Bulletin 670 (Final Contract report), p 13-15, August 1973. USBR Contract 14-06-D-7171.

Descriptors: *Cloud seeding, *Weather modification, *Montana, Ecology, Social impact, Agriculture, Crop production, Economic impact, Political aspects, Grasslands, Grazing, *Wildlife, *Biological communities.

In Montana, artificially increased rainfall will probably not affect big game species to any great extent. Major changes in vegetation may change distribution of big game animals. Added precipitation is not the major factor that will affect wildlife species. It is the changes in land use and different managerial practices that are brought about by weather modification. These changes can be beneficial or detrimental to the future of many wildlife species depending upon how the land is used and managed. (See also W74-06442) (Knapp-USGS)
W74-06444

AGRICULTURAL IMPACTS,
Montana State Univ., Bozeman. Dept. of Plant and Soil Science.
J. M. Caprio, and J. S. Williams.
In: Impacts of Induced Rainfall on the Great Plains of Montana: Montana Agricultural Experiment Station Bulletin 670 (Final contract report), p 18-24, August 1973. 3 fig. USBR Contract 14-06-D-7171.

Descriptors: *Cloud seeding, *Weather modification, *Montana, Ecology, Social impact, Agriculture, *Crop production, *Economic impact, Political aspects, Grasslands, Grazing, Wildlife.

Because the leading industry in Montana is agriculture, the effect of weather modification operations could have an important impact on the economy of the state. Both crop and range condition data were analyzed for precipitation response by the orthogonal polynomial approach. Small grain yield responses varied from a low of 0.5 to a high of 2.2 bushels per acre, depending upon the crop and the assumed condition. Responses for barley were higher than for spring wheat or winter wheat. Range condition responses varied from a low of 3.2 units to a high of 5.7 units, depending upon the assumed condition. Statistical analyses suggested general relations for the Great Plains area of Montana. For the growing season, drought is most usually linked to deficits of precipitation from about May 3 through June 13. For the growing season, abundant precipitation is most usually linked to high precipitation amounts from about May 10 to June 27 and July 19 to August 1, the former period being most important. For the nongrowing season, drought is most usually linked to deficits of precipitation from about September 13 through October 17. For the nongrowing season, abundant precipitation is most usually linked to high precipitation amounts during the period from about September 6 to 19. (See also W74-06442) (Knapp-USGS)
W74-06445

HYDROLOGY IMPACTS: PART I--GROUND WATER HYDROLOGY,
Montana State Univ., Bozeman. Dept. of Sociology.
M. R. Miller, and E. Bond.
In: Impacts of Induced Rainfall on the Great Plains of Montana: Montana Agricultural Experiment Station Bulletin 670 (Final contract report), p 37-42, August 1973. 2 tab. USBR Contract 14-06-D-7171.

Descriptors: *Weather modification, *Hydrogeology, *Montana, Recharge, Water balance, Hydrograph analysis, Mining, Groundwater, Base flow.

The impact that increased precipitation due to cloud seeding would have on the groundwater system in the Great Plains area of Montana was evaluated by hydrograph analysis. As long as present conditions and farming practices continue, allowing the excess moisture to move through the subsoil and till and to contribute water to the seep areas, the problem can only get worse. Also, under the present conditions, increased precipitation due to cloud seeding during the spring months could serve to aggravate the problem, however, if the added precipitation comes during the summer months, available data indicate that it would have very little effect on the saline-seep problem. A disadvantage of increased rainfall during mining operations is that any significant amount of water accumulating in the coal must be removed prior to mining. Perhaps the greatest need for rainfall is after an area is mined and the spoil banks must be reclaimed. Added rainfall would greatly enhance the regrowth of vegetation, although locally there could be some saline problems. (See also W74-06442) (Knapp-USGS)
W74-06446

HYDROLOGY: PART II--SURFACE HYDROLOGY AND GEOMORPHOLOGY,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
J. M. Ashley, Jr.
In: Impacts of Induced Rainfall on the Great Plains of Montana: Montana Agricultural Experiment Station Bulletin 670 (Final contract report), p 43-52, August 1973. 3 fig. USBR contract 14-06-D-7171.

Descriptors: *Weather modification, *Montana, *Erosion, Geomorphology, Soil erosion, Vegetation effects, Precipitation(Atmospheric), Rainfall-runoff relationships.

Most of Montana would be relatively unimpaired by artificial increases in precipitation as long as the natural temporal pattern is duplicated and rainfall intensities are low to moderate. Most soils found in the region are capable of absorbing water at high rates, especially when comparatively dry. Even in areas of great susceptibility to erosion, long-term benefits may substantially outweigh short-term losses, especially if standardized precipitation management programs are adopted as the vegetal cover improves. (See also W74-06442) (Knapp-USGS)
W74-06447

WAX-TREATED SOILS FOR HARVESTING WATER,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
D. H. Fink, R. Cooley, and G. H. Frasier.
Journal of Range Management, Vol 26, No 6, p 396-398, November 1973. 1 fig, 1 tab, 12 ref.

Descriptors: *Water harvesting, *Soil treatment, *Application methods, Runoff, Evaporation control, *Soil surfaces, Precipitation(Atmospheric), Demonstration watersheds, Water yield improvement, Infiltration rates, *Arizona, Water quality, Ranges, Carrying capacity.
Identifiers: *Paraffin wax, Mesa(Ariz), *Hydrophobic soils.

Water harvesting promises to alleviate water shortages on rangelands that limit livestock-carrying capacity. This study examined the use of paraffin wax applied as flakes or granules to the soil surface. The wax was allowed to melt and spread in the desert sun forming a hydrophobic soil surface, which would allow runoff. The wax-treated plots averaged 90 percent precipitation runoff yield compared to 30 percent on the untreated plots. The quality of the runoff water from the waxed plots was good overall. The experimental watershed plots were located at the Granite Reef test facility near Mesa, Arizona. (Mastic-Arizona)
W74-06457

FLOATING SHEETS OF FOAM RUBBER FOR REDUCING STOCK TANK EVAPORATION,
Agricultural Research Service, Logan, Utah.
A. R. Dedrick, T. D. Hansen, and W. R. Williamson.
Journal of Range Management, Vol 26, No 6, p 404-406, November 1973. 3 fig, 1 tab, 17 ref.

Descriptors: *Evaporation control, *Reservoir storage, *Stock water, *Synthetic rubber, *Costs, Evaporation, Water harvesting, Storage tanks, Water storage, *Utah, *Synthetic rubber.

Evaporation control for stock tanks is investigated using floating sheets of foam rubber. This synthetic rubber is highly resistant to weathering and can be formed into a continuous cover by lap jointing using contact cement. Results of test tanks in Utah showed evaporation reductions of about 75% when 95% of the water surface was covered. Some problems encountered included pecking damage by birds, dust accumulation which plugged some boiling holes, and cover separation due to ice formation. Some modifications have reduced these problems. Estimated cost to save potentially evaporated water in a 4-foot evaporation zone ranges from about $1.80 to $2.00 per 1,000 gallons, with an estimated cover life of approximately ten years. (Mastic-Arizona)
W74-06458

WATER HARVESTING EFFICIENCIES OF FOUR SOIL SURFACE TREATMENTS,
Agricultural Research Service, Laramie, Wyo.
F. Rauzi, M. L. Fairbourn, and L. Landers.
Journal of Range Management, Vol 26, No 6, p 399-403, November 1973. 4 tab, 14 ref.

Descriptors: *Water yield improvement, *Water harvesting, *Soil treatments, *Roofing materials, *Application methods, Soil surfaces, Salts, Runoff, Precipitation(Atmospheric), Snow melt, Storage tanks, Sediments, Gravels, Soil types, *Wyoming, *Colorado, Paving, On-site data collections, Ranges, Plastics.

Efficiencies of four soil surface treatments for water harvesting were studied at the Central Plains Experimental Range, Colorado, and at Gillette, Wyoming, over a 5-year period. The water harvesting system consists of collecting and storing water from land treated to increase runoff. This method can be employed on rangelands in excellent condition, but with little or no available water supply. The four soil surface treatments consisted of salt (NaCl), plastic covered with gravel, asphalt roll roofing, and untreated rangeland. Average water harvesting efficiencies ranged from 5% on rangeland at Gillette to 105% for asphalt roll roofing at the Central Plains Experimental Range. Plastic covered with pea gravel and salt treatments were generally unsatisfactory. The asphalt roll roofing treatment showed the greatest potential for water harvesting quantity and good water quality. (Mastic-Arizona)
W74-06463

NEW DIRECTIONS IN THE CHILEAN NORTH,
Colorado Univ., Boulder. Dept. of Geography.
D. D. MacPhail, and H. E. Jackson.
In: Coastal Deserts, their natural and human environments, ed. by D. H. K. Amiran and A. W. Wilson. University of Arizona Press, Tucson, 1973, p 123-136. 12 fig, 35 ref.

Descriptors: *Deserts, *Arid lands, Land development, Land management, Coasts, Arid climates, Desert plants, Land reclamation, Urbanization, Regional development, Water resources development, Mining, Copper, Agriculture, Fishing, Fisheries, Fish management, Energy, Desalination, Fog, Water harvesting.
Identifiers: *Chile.

The renewable resources of water, energy, fish and soil have become essential in the continuing development of the arid zones of northern Chile. Although water transport provisions have been able to supply sufficient water for current needs, future urban development in the region will depend on solar or diesel powered desalination and the design of commercially usable units to extract moisture from the region's fogs. Currently copper mining and production is the principal economic pursuit of Chile, but since copper is not a renewable resource, planning must be done for the time when it no longer offers the economic support it does in the current unbalanced economy. Research and development of water and energy resources is necessary to be prepared for this economic reorientation. The role of social perception of the area by its inhabitants in regional development is emphasized. A short historic description and an outline of current developments in mining, agriculture, fishing, urbanization, water and energy are included. (Muller-Arizona)
W74-06476

3C. Use Of Water Of Impaired Quality

SALINITY-OZONE INTERACTIVE EFFECTS ON YIELD AND WATER RELATIONS OF PINTO BEAN,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
G. J. Hoffman, S. V. Maas, and S. L. Rawlins.
J Environ Qual. Vol 2, No 1, p 148-152. 1973. Illus.
Identifiers: *Beans(Pinto), Interactive, *Ozone, Phaseolus-Vulgaris, Resistance, *Salinity-ozone interaction, Stomatal, Transpiration, *Crop yield.

The interaction of salinity and ozone on the growth of pinto bean (Phaseolus vulgaris L.) was evaluated in a controlled temperature light room. Salinity treatments having osmotic potentials of -0.4, -2.0, and -4.0 bars were studied in combination with 2-hr daily exposures to 0, 0.15, 0.25 and 0.35 ppm of ozone. Ozone of 0.15 ppm decreased the yield of nonsaline plants nearly 50%; and at 0.25 ppm and higher, no significant yield was obtained. The results were essentially the same for plants salinized to -2.0 bars. At -4.0 bars, the yield at 0.25 ppm was only reduced to half that of the ozone-free treatment. The results indicate no interaction between salinity and ozone below 0.15 ppm. Above 0.15 ppm, however, there is a large interaction. At salinities of -0.4 and -2.0 bar, water-use efficiency decreases as ozone increased. Ozone did not appear to influence leaf water potential or its components.--Copyright 1973, Biological Abstracts, Inc.
W74-06070

CONSUMPTION OF WATER BY THE COTTON PLANT AT DIFFERENT CONCENTRATIONS OF SOIL SOLUTION, (IN RUSSIAN),
S. N. Ryzhov, and N. I. Zimina.
Uzb Biol Zh. Vol 16, No 2, p 20-24, 1972.
Identifiers: *Chlorides, *Cotton, Excretion, *Fertilizers(Mineral), Sap, Soils, *Sulfates, Water utilization(Plants), *Salinity.

The effect of mineral fertilizers was studied in soils with high chloride and sulfate salinity. Cotton was cultivated in Wagner containers. At salination with chlorides, fertilizers promoted crop increase, but efficiency decreased. With sulfates the fertilizer efficiency decreased even more sharply. Under the influence of fertilizers, the productivity of water utilization by the cotton plant increased 3-4 times. With increased fertilization the water utilization increased slowly. The amount of excreted sap decreased sharply with the increase of salinity, but it increased with increased doses of fertilizers. Sap excretion was lower with sulfate salinity.--Copyright 1973, Biological Abstracts, Inc.
W74-06236

CONTRIBUTION TO THE STUDY OF THE ACTION OF WATER-SOLUBLE AND CITRATE-SOLUBLE PHOSPHORIC UNDER ACIDS DIFFERENT MOISTURE CONDITIONS, (IN SERBO-CROATION),
Institute for Soil Research, Belgrade (Yugoslavia).
Z. Popovic, R. Kovacevic-Tatic, and D. Stevanovic.
Agrohemija. 1/2, p 25-35, 1972.
Identifiers: Citrates, *Oats, *Phosphoric acids, Soluble phosphates, *Phosphates, Soil moisture, *Fertilizers.

Pot trials were conducted in which the action of water-soluble and citrate-soluble phosphoric acids on the yield and the content of phosphorus in the seed of spring oats was studied under different moisture conditions. Soil moisture was maintained at 35 or 65% water capacity and the types of soil investigated for productivity were chernozem and smonitsa. P fertilizers are more effective in regions and years with low precipitation. Water-soluble phosphates are a better source of P for plants, particularly under conditions of soil moisture deficiency.--Copyright 1973, Biological Abstracts, Inc.
W74-06315

INTERACTIVE EFFECTS OF SALINITY AND OZONE ON GROWTH AND YIELD OF GARDEN BEET,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
G. Ogata, and E. V. Maas.
Journal of Environmental Quality, Vol 2, No 4, p 518-520, October-December, 1973. 2 tab, 12 ref.

Descriptors: *Air pollution effects, *Ozone, *Salinity, Saline soils, Osmotic pressure, Soil chemical properties, Salt tolerance, *Growth rates, *Crop production.
Identifiers: *Garden beets(Beta vulgaris).

The interactive effects of root media salinity and ambient ozone on injury, growth, and yield of garden beets were determined under controlled environmental conditions. Plants were grown in non-saline and saline nutrient solution cultures having osmotic potentials of -0.4, -4.4, and -8.4 bars respectively, and were exposed 5 weeks to 0.2 ppm ozone for 0 to 3 hours/day. Growth of the nonsaline beet plants was not significantly affected by 0.20 ppm ozone until exposure times exceeded 1 hour/day, although foliar injury in the form of a reddish-purple stipple had developed on mature leaves. Longer ozone exposures produced severe leaf necrosis and reduced the growth of tops and storage and fibrous roots as much as 50, 40, and 67%, respectively. In contrast, foliar ozone injury on plants grown in saline media developed more slowly and the growth of both tops and roots was relatively unaffected by ozone exposures of up to 3 hours/day. The beneficial effect of salinity in reducing ozone damage was offset by the suppressive effect of salinity on the yield of the storage root. (Skogerboe-Colorado State)
W74-06342

RESULTS OF THE WASHING OF SOILS OF ALEISK IRRIGATION SYSTEM BY MINERALIZED WATERS (IN RUSSIAN),
Novosibirsk Inst. of Agrochemistry and Soil Science (USSR).
I. B. Dolzhenko.
Izv Sib Otd Akad Nauk SSSR Ser Biol Med Nauk 2, p 7-13. 1972. Illus. English summary.
Identifiers: Irrigation systems, Mineralized soils, Salts, *Sulfate soils, Toxicity, *USSR(Aleisk irrigation systems), *Saline soils.

Sulfate-salined soil washing was studied under field conditions using soil monoliths. A great bulk of the salts was in the 0-50 cm layer and amounted to 0.796%/dry soil weight. The soils were washed with saline waters containing different amounts o

toxic salts (0.2-3.0 g/l). The preliminary experimental washings were effective against a draining background.--Copyright 1973, Biological Abstracts, Inc.
W74-06404

DESALTED SEAWATER FOR AGRICULTURE: IT IS ECONOMICAL,
Resources for the Future, Washington, D.C.
For primary bibliographic entry see Field 3A.
W74-06467

PLASTIC OASES FOR ARID SEASHORES,
Arizona Univ., Tucson. Environmental Research Lab.
For primary bibliographic entry see Field 3A.
W74-06468

3D. Conservation In Domestic and Municipal Use

STUDIES IN THE ANALYSIS OF METROPOLITAN WATER RESOURCE SYSTEMS, VOLUME VIII: SOME DATA AND METHODS FOR ANALYZING METROPOLITAN WASTEWATER RECLAMATION AND REUSE SYSTEMS,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5D.
W74-05951

RIVERINE RECREATIONAL DEVELOPMENT--MATHEMATICAL MODELING,
Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-05958

THE CITY OF FRESNO'S LEAKY ACRES GROUND-WATER RECHARGE PROJECT--CONSTRUCTION AND PERFORMANCE,
Agricultural Research Service, Fresno, Calif. Ground Water Recharge Field Station.
For primary bibliographic entry see Field 4B.
W74-06358

3E. Conservation In Industry

ENVIRONMENTAL ASPECTS OF THE POWER INDUSTRY,
Portland General Electric Co., Oreg.
For primary bibliographic entry see Field 6G.
W74-06111

UTILIZATION OF BARK WASTE,
Oregon State Univ., Corvallis. Dept. of Forest Products.
For primary bibliographic entry see Field 5A.
W74-06379

WATER AND WASTE WATER MANAGEMENT IN THE MANUFACTURE OF STRUCTURAL FIBERBOARDS IN POLAND (ZAGADNIENIA GOSPODARKI WODNOSCIEKOWEJ PRZEMYSLU PLYT PILSNIOWYCH NA TLE GOSPODARKI WODNEJ W POLSCE),
For primary bibliographic entry see Field 5D.
W74-06380

CALCULATION OF FRESHWATER CONSUMPTION (NALADIT' UCHET RASKHODA SVEZHEI VODY),
For primary bibliographic entry see Field 5D.
W74-06381

WATER USAGE IN THE BRITISH PAPER AND BOARD INDUSTRY,
Research Association for the Paper and Board, Printing and Packaging Industries, London (England). Paper and Board Div.
For primary bibliographic entry see Field 5D.
W74-06383

CAN SCREENED WHITE WATER BE RECYCLED TO SHOWER FELTS,
Trent Valley Paperboard Mills (Ontario).
For primary bibliographic entry see Field 5D.
W74-06384

THE ANTI-POLLUTION SEQUENCE - A NEW ROUTE TO REDUCED POLLUTANTS IN BLEACH PLANT EFFLUENT,
Hooker Chemical Corp., Niagara Falls, N.Y.
For primary bibliographic entry see Field 5D.
W74-06385

PRACTICAL APPROACH TO WATER CONSERVATION IN A PAPER MILL,
Papeteries Boucher, Calais (France).
For primary bibliographic entry see Field 5D.
W74-06387

SOME PROBLEMS ASSOCIATED WITH WATER REUSE,
Betz Labs., Inc., Trevose, Pa.
For primary bibliographic entry see Field 5D.
W74-06388

RECENT ADJUSTMENTS IN WATER USE AND TREATMENT BY U.S. MANUFACTURERS,
Urban Inst., Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-06395

THE IMPACT OF CHANGING COST AND QUALITY OF INDUSTRIAL WATER ON TECHNICAL CHANGE AND PLANT LOCATION DECISIONS,
National Bureau of Economic Research, New York.
R. A. Leone, and J. R. Ginn.
In: Proceedings (Vol III), The International Symposium on the Planning of Water Resources, Mexico City, December 4-8, 1972. 56 p, 6 fig, 9 tab, 3 ref.

Descriptors: *Industrial water, *Water costs, *Water quality, *Water utilization, *Evaluation, *Water demand, Technology, Mathematical models, Prices, Water availability, Decision making, Equations, Systems analysis.
Identifiers: *Impact analysis.

Major shifts in industrial water use technology have been occurring in recent years in the United States. Factors contributing to these changes include: modernization of technological processes in newly added plants; and variations in the price, availability, and quality of water. For example, high effluent treatment costs have caused a dramatic increase in water costs; even with relatively small water demand elasticities, price changes of such magnitude can have a substantial effect on water usage. The effects are described of these changes in the cost and quality of water on technological changes in process design and plant location decisions. The framework within which industry location decisions are made is discussed in an attempt to put the importance of water in proper perspective. A simple, empirically testable model is presented of the demand for water in water-using industries. The model is intended to suggest reduced-form equations that will ultimately be subjected to empirical test. The Cobb-Douglas functional form is chosen for manipulative convenience. The model parameters are empirically estimated to identify the extent to which the demand for water by industry responds to both the changing cost of water and technological change. Empirical findings to date are summarized. (Bell-Cornell)
W74-06424

HYDROLOGY IMPACTS: PART I--GROUND WATER HYDROLOGY,
Montana State Univ., Bozeman. Dept. of Sociology.
For primary bibliographic entry see Field 3B.
W74-06446

3F. Conservation In Agriculture

CHEMICAL AND SEDIMENT MOVEMENT FROM AGRICULTURAL LAND INTO LAKE ERIE, SUPPLEMENT REPORT,
Ohio State Univ., Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W74-05955

CROP AND FOOD CHAIN EFFECTS OF TOXIC ELEMENTS IN SLUDGES AND EFFLUENTS,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 5D.
W74-05978

CROP SELECTION AND MANAGEMENT ALTERNATIVES--PERENNIALS,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5D.
W74-05979

RECYCLING URBAN EFFLUENTS ON LAND USING ANNUAL CROPS,
Arizona Univ., Tucson. Dept. of Agronomy and Plant Genetics.
For primary bibliographic entry see Field 5D.
W74-05980

RECYCLING MUNICIPAL SLUDGES AND EFFLUENTS ON LAND,
Williams and Works, Grand Rapids, Mich.
For primary bibliographic entry see Field 5D.
W74-05982

ECONOMIC ASPECTS OF THE APPLICATION OF MUNICIPAL WASTES TO AGRICULTURAL LAND,
Illinois Univ., Urbana.
For primary bibliographic entry see Field 5D.
W74-05983

LITTLE CREEK WATERSHED PROJECT, LAURENS AND WHEELER COUNTIES, GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Athens, Ga.
For primary bibliographic entry see Field 4D.
W74-05996

VENICE MALLOW COMPETITION IN SOYBEANS,
Kansas State Univ., Manhattan. Dept. of Agronomy.
B. J. Eaton, K. C. Feltner, and O. G. Russ.
Weed Sci. Vol 21, No 2, p 89-94, 1973. Illus.
Identifiers: Glycine-max, Hibiscus-trionum, Moisture, Soils, *Soybeans, *Venice mallow, Weeds, *Plant competition.

Competition studies were conducted with soybeans Glycine max (L.) Merr. 'Clark 63' and Venice mallow (Hibiscus trionum L.). One Venice mallow/7.5 cm of soybean row reduced soybean seed yield 632 kg/ha after 85 days competition.

Thirty to forty-cm weed bands in and between soybean rows reduced yields 270-651 kg/ha with 35-40 days of competition. A natural stand of 215 Venice mallow plants/m sq reduced soybean yield 454 kg/ha after 30 days of competition, and competition up to 110 days reduced yield as much as 1490 kg/ha. Weed competition affected the number of pods per soybean plant more than any other seed-yield component, and soybean height was reduced. Soybean yields were reduced more when soil moisture was abundant early in the growing season and limited in late summer than when moisture was limited early in the growing season and above average until soybeans matured.--Copyright 1973, Biological Abstracts, Inc.
W74-06077

DETERMINATION OF RESIDUES OF MESUROL AND ITS TOXIC METABOLITES IN PLANT AND ANIMAL TISSUES,
Baychem Corp., Kansas City, Mo. Chemagro Div.
For primary bibliographic entry see Field 5A.
W74-06128

EFFECT OF SOME FORMS OF NITROGEN FERTILIZERS ON THE DEVELOPMENT AND CHEMICAL COMPOSITION OF THE FLUE CURED TOBACCO AT DIFFERENT SOIL MOISTURE, (IN POLISH),
Instytut Uprawy Nowozenia i Gleboznawstwa, Pulawy (Poland).
Z. Wirowski, and I. Arazna.
Pamiet Pulawski. 49 p, 129-147, 1971. Illus. (English summary).
Identifiers: Carbohydrates, Chemical composition, *Fertilizers, Nicotine, *Nitrogen, Protein, *Soil moisture, *Tobacco.

In field experiments with sufficient N content in the soil, and with an application of 200 q of farmyard manure/ha there was no dependence of yield weight on the applied form of N. The greatest influence on the weight increase of whole plants as well as of leaves, stems and roots, was exerted by higher soil moisture. The greatest plant weights were obtained with CaNO3, urea, NH4NO3 and (NH4)2SO4 in decreasing order. Under the conditions of increased soil moisture tobacco in the blossoming period was the highest after the application of nitrates and urea forms, at the lower moisture on the contrary, urea had the slightest effect on the plant elongation. Calcium and ammonium nitrates had a better influence on the plant weight increase and on elongation, but poorer leaf physical features were observed. The weight of leaves in relation to stems became also lower by 1 to 4%. Ammonium sulfate and urea decreased the percentage of total N, protein and nicotine and increased the content of carbohydrates. In pots with lower soil moisture, leaves contained more total N, protein and nicotine and less carbohydrates.--Copyright 1973, Biological Abstracts, Inc.
W74-06137

PRODUCTIVITY OF INDIVIDUAL VARIETIES OF GRAIN CULTURES IN CONNECTION WITH CHARACTERISTICS OF WATER REGIME IN NON-IRRIGATED AREAS, (IN RUSSIAN),
Ya. G. Sultanov.
Izv Akad Nauk Az SSR Ser Biol Nauk. 3 p 36-38, 1971. Illus.
Identifiers: *Barley, Cultures, Grain, Non-irrigated areas, Productivity, Regime, *USSR, Azerbaidzhan, Varieties, *Wheat.

From 1967 to 1969 in the non-irrigated areas of the Dzhaliabad region of Azerbaidzhan 2 wheat and 3 barley cultivars were compared. The 2-yr experiments showed that 'Dzhafari' wheat was superior to the 'Shark' variety, and 'Palladium-330' barley superior to 'Palladium-596' and 'Sharvandani' in this dry region.--Copyright 1973, Biological Abstracts, Inc.
W74-06139

CHARACTERISTIC CHANGES IN WATER FORMS IN CEREAL TYPE, LEAVES CULTIVATED WITHOUT IRRIGATION, (IN AZERBAIJAN),
M. A. Ali-Zade, and J. G. Sultamov.
Dokl Akad Nauk Az SSR. Vol 27, No 9, p 97-99, 1971. (English summary).
Identifiers: *Barley, Cereal type, Cultivated areas, Irrigation, *Leaves, *Wheat.

The total, free and bound water content was studied in the leaves of 2 types of wheat and 3 types of barley. The wheat cultivar 'Jafari' had a higher content of bound water than 'Shark' and 'Palidum-330' had the highest bound water content of the barley varieties.--Copyright 1973, Biological Abstracts, Inc.
W74-06233

NET ASSIMILATION, WATER USE AND MICROCLIMATE OF A MAIZE CANOPY: III. SPECTRAL COMPOSITION OF THE LIGHT INSIDE THE CROP, (IN FRENCH),
Centre de Recherches Agronomiques des Antilles et de la Guyane, Petit Bourg (Guadeloupe).
C. Varlet Grancher, and R. Bonhomme.
Ann Agron (Paris). Vol 22, No 5, p 515-525, 1971. Illus. (English summary).
Identifiers: Climates, Crop, Light, *Maize canopy, Net assimilation, Spectral composition, Water utilization, *Photosynthesis, *Solar radiation.

The net assimilation of the crop depends on the solar radiation intercepted by the leaves. The response of the leaf varies according to the energy and the spectral composition of the light. The spectral composition of the light and especially the ratio of photosynthetically active radiations (400-700 nm) to the near IR radiations from the sun (700-3000 nm) are modified inside the canopy. The spectral composition is expressed in relative value. The basis is the spectral composition of the sunlight as measured upon a horizontal plane above the canopy. The spectral composition of the light of the sunfleck areas is shown. From the relative sunfleck area profile and the spectral composition of the light in sunlit and shaded areas, it is possible to compute the energy which can be used for photosynthesis and the optical properties of the whole canopy.--Copyright 1973, Biological Abstracts, Inc.
W74-06239

THE INFLUENCE OF DRY PERIODS AT VARIOUS STAGES OF DEVELOPMENT: INVESTIGATIONS OF THE WATER ECONOMY IN OATS AND MILLET,
Institutul de Cercetari Pentru Cereale si Plante Tehnice, Fundulea (Rumania).
C. Pintilie, P. Boland, and A. Voemel.
Z Acker- Pflanzenbau. Vol 136, No 2, p 119-138, 1972. Illus. (English summary).
Identifiers: Avena-sativa, *Dry periods, *Millet, *Oats, Panicum-miliaceum, *Water utilization(Crops).

In climatically controlled glass chambers in the phytotron at Rauisch-Holzhausen drought experiments were carried out with oats (Avena sativa L.) as a plant species of humid climates and with the relatively drought-resistant millet (Panicum miliaceum L.) in Mitscherlich vessels with 2 conventional soil types (degraded loess and alluvial loam soils) and in model soils with varying hygroscopic properties. The object was to determine the resistance of the plants to drought periods at different stages of development. By comparing the values for suction pressure of the plants (by Schardakow's method), for the water content of the soil and the yield per plant (in millet) it was possible to make predictions on the utilization of the soil water and the efficacy of renewed watering after drought periods of varying duration and in different stages of the plant's development.--Copyright 1973, Biological Abstracts, Inc.
W74-06243

DEPENDENCE OF PLANT THERMORESISTANCE ON THERMODYNAMIC PROPERTIES OF SOIL MOISTURE, (IN RUSSIAN),
Moscow State Univ. (USSR).
N. A. Muromtsev, Z. G. Magomedov, and Ya. E. Doskoch.
S-Kh Biol. Vol 7, No 4, p 559-564, 1972. Illus. (English summary).
Identifiers: *Lettuce, Moisture, *Oats, Soils, Thermoresistance(Plants), Thermodynamic properties, *Wheat, *Transpiration.

The thermoresistance of plants (wheat, oats and lettuce) depends on the thermodynamic properties of soil moisture, relative transpiration and absorbing force of plant leaves. The decrease of soil moisture content by 1/3 of the initial value (of the total water-holding capacity) conforms to the maximum rise of thermoresistance in plants. Their relative transpiration is maintained at a constant level. The further increase in the soil moisture deficit results in the sharp fall of the relative transpiration and thermoresistance in plants.--Copyright 1973, Biological Abstracts, Inc.
W74-06244

WATER METABOLISM AND DYNAMICS OF LABELED PHOSPHORUS IN APPLE LEAVES. (IN RUSSIAN),
M. D. Kushnirenko, V. I. Kiliyanchuk, and E. A. Goncharova.
Izv Akad Nauk Mold SSR SER Biol Khim Nauk 3, p 13-18, 1972. Illus.
Identifiers: *Apple leaves, *Metabolism(Plants) *Phosphorus-32, *Transpiration, Soil-water-plant relationships, Absorption.

The uptake of labeled P from soil depends on the level of soil water content and plant water status The rhythms of labeled P accumulation in apple leaves depends on the transpiration process, but in the case of a water shortage the 32P accumulation in leaves occurs with decreased transpiration.--Copyright 1973, Biological Abstracts, Inc.
W74-06245

YIELD DETERMINATIONS IN PERMANENT PASTURES AT DIFFERENT LOCATIONS: INTERACTIONS BETWEEN LOCATION AND MANURING INTENSITY, (IN GERMAN),
Bonn Univ. (West Germany). Institut fuer Pflanzenbau.
W. O. Boberfeld.
Z Acker Pflanzenbau. Vol 135, No 4, p 326-337 1972. (English summary).
Identifiers: *Altitudes, Fodder, *Manuring intensity, *Pastures, Rainfall, Temperature, Winter *Grassland yields.

The yield difference in the location group with differing amounts of rainfall is significant. In the location group with different amounts of winter rainfall the yield difference is not statistically significant. At higher altitudes the temperature sequence in the spring clearly exerts a particularly strong influence on the annual yield from grassland. The manuring effect was mostly dependent on location. The degree of effectiveness of a manurial application was particularly high at lower levels of manuring. The mean index for fodder value of the plant populations rose after 2 growing periods with increasing manurial intensity. Injuries to winter survival were found to be related to manurial intensity and altitude.--Copyright 1973, Biological Abstracts, Inc.
W74-06251

SPATIAL VARIATION PATTERNS OF MOISTURE CONTENT OF IRRIGATED SOIL UNDER COTTON (ZAKONOMERNOST PROSTRANSTVENNOY IZMENCHIVOST VLAZHNOSTI OROSHAYEMOY POCHVY POD KHLOPCHATNIKOM),
Sredneaziatskii Gosudarstvennyi Institut po Proektirovaniyu Irrigatsionnykh Sooruzhenii i Selskikh Elektrostantsii, Tashkent (USSR).

For primary bibliographic entry see Field 2G.
W74-06303

PROBLEMS OF CHOOSING IRRIGATION TECHNIQUES IN A DEVELOPING COUNTRY,
Pahlavi Univ., Shiraz (Iran). Dept. of Agricultural Economics.
G. R. Soltani-Mohammadi.
Water Resources Research, Vol 8, No 1, p 1-6, February, 1972. 4 tab, 13 ref.

Descriptors: *Irrigation practices, Economics, *Comparative costs, Computer models, Irrigation engineering, Irrigation design, *Irrigation systems, Surface irrigation, *Sprinkler irrigation.
Identifiers: *Iran, Developing countries.

A linear programing model is developed to select between modern surface and portable or semiportable sprinkler systems for two irrigation projects in Iran. Skilled labor is included in the model as one of the major limiting factors. For the specified conditions and assumptions, a portable or semiportable sprinkler system is indicated to be economically superior to a modern surface irrigation system for the development of new lands. However, in lands where a modern surface irrigation system has already been installed the transformation to sprinkler irrigation is not feasible. A completely automated sprinkler system is not indicated for either set of conditions in Iran. Primitive irrigation was not included in this study because of lack of data. Welfare effects of the choice of techniques are indicated. (Skogerboe-Colorado State)
W74-06333

SIMULATION OF POST-IRRIGATION MOISTURE MOVEMENT,
Auburn Univ., Ala. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W74-06335

APPROXIMATE SOLUTION FOR UNCONFINED SEEPAGE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W74-06338

PHYSICAL MODEL STUDY OF BORDER-STRIP IRRIGATION,
G. A. Jobling, and A. K. Turner.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 99, No IR4, p 493-510, December, 1973. 14 fig, 1 tab, 20 ref.

Descriptors: *Hydraulic models, *Infiltration, *Infiltration, *Irrigation systems, Hydraulics, Model studies, Roughness(Hydraulic), Surface irrigation, Uniform flow, Water distribution(Applied).
Identifiers: *Border-strip irrigation.

A physical model of an irrigation border was constructed and tested. Equations are developed which describe the profile of the water advancing down the border, the rates of advance, and recession after the inflow is cut off, in terms of inflow, infiltration, slope, and surface roughness. These equations are simplified to a form more suitable for use in design. An illustrative analysis is done to determine correct inflows and cutoff times needed to uniformly irrigate to a desired depth. (Skogerboe-Colorado State)
W74-06340

NITROGEN AND PHOSPHORUS COMPOSITION OF SURFACE RUNOFF AS AFFECTED BY TILLAGE METHOD,
Agricultural Research Service, Lafayette, Ind.
For primary bibliographic entry see Field 5B.
W74-06344

NITROGEN LOSSES IN SURFACE RUNOFF FROM AGRICULTURAL WATERSHEDS ON MISSOURI VALLEY LOESS,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 5B.
W74-06345

LONG-TERM EFFECTS OF MANURE, FERTILIZER, AND PLOW DEPTH ON CHEMICAL PROPERTIES OF SOILS AND NUTRIENT MOVEMENT IN A MONOCULTURE CORN SYSTEM,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
For primary bibliographic entry see Field 5B.
W74-06346

THEORETICAL IRRIGATION TAILWATER VOLUMES,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
O. C. Wilke.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 99, No IR3, p 415-420, September, 1973. 1 fig.

Descriptors: *Irrigation, *Agricultural runoff, *Irrigation practices, Irrigation design, *Tailwater, Furrow irrigation, Irrigation systems, Surface runoff.

A volume balance theory and graphical relationships for predicting irrigation tailwater volumes are presented. An equation is derived for determining tailwater pumping rates for the case where tailwater is continuously recirculated. Dimensionless graphs illustrate the effects of the time period of runoff on both runoff volumes and irrigation uniformity. Use of this information could improve the management of furrow irrigation systems and also aid in the design of tailwater pits, pumps, and return pipelines. (Skogerboe-Colorado State)
W74-06347

AQUACULTURAL DEVELOPMENTS IN PERU,
Auburn Univ., Ala. International Center for Aquaculture.
D. D. Moss.
Available from NTIS, Springfield, Va 22151 as PB-211 671 Price $3.00 printed copy; $1.45 microfiche. April 1972. 51 p, 15 fig, 2 tab, 6 ref.

Descriptors: *Fisheries, *Aquiculture, Surveys, Reviews, Fish farming, Commercial fishing, Governments.
Identifiers: *Peru.

The present status of aquaculture in Peru is reviewed with a series of recommendations for future development. The topics include the potential for coldwater and warmwater fish culture; a proposed project for culturing fish in pens; a proposed warmwater aquacultural research station; organizational structure of the Ministry of Fisheries; existing fisheries stations and equipment; and fisheries personnel and their training. (Knapp-USGS)
W74-06353

WATERVLIET PAPER COMPLETES WASTE WATER DISPOSAL SYSTEM.
For primary bibliographic entry see Field 5D.
W74-06415

AGRICULTURAL IMPACTS,
Montana State Univ., Bozeman. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 3B.
W74-06445

THE FISH-MEAL INDUSTRY OF IQUIQUE,
Universidad Catolica de Valparaiso (Chile). Departamento de Geografia.
M. R. Salinas.
In: Coastal Deserts, their natural and human environments, ed. by D. H. K. Amiran and A. W. Wilson. University of Arizona Press, Tucson, 1973, p 137-146. 5 fig, 5 tab, 16 ref.

Descriptors: *Fishing, *Commercial fishing, *Fish harvest, *Fish conservation, Fish management, Fish populations, Fish handling facilities, Aquatic productivity, Food chains.
Identifiers: Fish-meal, *Chile(Iquique), Anchovy.

As the nitrate mining industry of northern Chile faded out, its place was taken by the fishing industry, patterned after the successful operations in Peru, and prompted by high world market prices for fishmeal. The most viable of the locations in Chile appeared to be at Iquique, where economic, geographic, social and industrial conditions were favorable. In addition, unemployed manpower from the mines was available. A significant increase in the standard of living has resulted, as well as a widening of associated employment opportunities. However, the recent disatrous disappearance of the anchovy upon which much of this industry was based has created a set-back from which the industry can recover only through more intelligent management and reorganization in terms of financial and structural changes, fishing fleet range limitations, diversification of fishing and processing, and technical improvements. There appears to be enough evidence of such improvements that the industry will recover and reestablish its recent prosperity. (Muller-Arizona)
W74-06477

ENCOURAGING RESIDUAL EFFECT OF PHOSPHORUS ON WHEAT WITH ONE IRRIGATION,
Maize Research Station, Chhindwara (India).
K. K. Mandloi, and K. P. Tiwari.
JNKVV (Jawaharlal Nehru Krishi Vishwa Vidyalaya) Res J. Vol 5, No 1, p 54-55. 1971.
Identifiers: Irrigation, *Phosphorus residuals, *Wheat, *Mung-wheat rotation.

A dose of 44.8 kg P2O5/ha seems to be an economical, profitable and suitable one for mung-wheat rotation under conditions of limited irrigation facilities.--Copyright 1973, Biological Abstracts, Inc.
W74-06496

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

CHEMICAL AND SEDIMENT MOVEMENT FROM AGRICULTURAL LAND INTO LAKE ERIE, SUPPLEMENT REPORT,
Ohio State Univ., Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W74-05955

THE COLUMBIA INTERSTATE COMPACT: POLITICS OF WATER RESOURCES IN THE PACIFIC NORTHWEST,
Washington State Univ., Pullman. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W74-05957

HYSTERETIC WATER FLOW IN A POROUS MEDIUM: EXPERIMENTAL STUDY AND NUMERICAL SIMULATION,
Illinois Univ., Urbana. Dept. of Agronomy.
For primary bibliographic entry see Field 2F.
W74-05959

LITTLE CREEK WATERSHED PROJECT, LAURENS AND WHEELER COUNTIES, GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Athens, Ga.
For primary bibliographic entry see Field 4D.
W74-05996

GROUND WATER PROBLEM AT NIOBRARA, NEBRASKA AND THE NIOBRARA STATE PARK (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Omaha, Neb.
Available from National Technical Information Service, Springfield, Va, 22151, as EIS-NB-72-1230-F, $6.25 in paper copy, $1.45 in microfiche. April 1973. 103 p, 7 fig, 1 tab, 3 plate.

Descriptors: *Water levels, *Drainage effects, *Watershed management, *Area redevelopment, *Seepage, *Sediment-water interfaces, Flood control, *Nebraska, Environmental effects, Legislation, Soil water movement, Water control, Government finance, Project planning, Community development, Social impact, Dredging, Levees, Public health, Safety.
Identifiers: *Environmental impact statements.

The federal Flood Prevention Act authorizes the Army Corps of Engineers to resolve the seepage and drainage problems in the Niobrara, Nebraska vicinity. The most feasible and desireable means to alleviate the problem would be to relocate Niobrara and to purchase Niobrara State Park. The citizens voted to reestablish their households and businesses in a new townsite and the state desires that the park be purchased. As the project has special Congressional authorization and is not amenable to the standard economic analysis, no benefit-cost ratio was calculated. Although relocation would change land uses, cause inconvenience, increase expenses and result in the loss of the state park as a tourist attraction, the current health, safety, and nuisance conditions threatening the residents because of the high water conditions would be alleviated. Alternative plans were considered, including levees and wells for ground water control, or the return to pre-project conditions by dredging and reduction of the normal operating level at Gavins Point Dam, but all appeared to have worse environmental consequences and higher economic costs, as well as being unacceptable to the citizens concerned. Measures to mitigate loss of environmental attributes are included in the relocation plan. (Sutton-Florida)
W74-06001

BURNT CREEK RC AND D MEASURE FOR FLOOD PREVENTION (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Bismarck, N. Dak.
Available from National Technical Information Service, Springfield, Va, 22151, as EIS-ND-73-1219-F, $4.25 in paper copy, $1.45 in microfiche. June 1973. 34 p, 3 map, 1 tab, 3 append.

Descriptors: *North Dakota, *Flood protection, *Flood damage, *Water resources development, Recreation, Irrigation programs, Agricultural engineering, Acreage, Crop production, Adoption of practices, Drainage, Water conservation, Engineering structures, Flood control, Irrigation systems, Flood routing, Runoff, Snowmelt, Check structures, Dikes, Dams, Precipitation, Project planning, Cost-benefit analysis, Direct costs, Direct benefits, Environmental effects, Wildlife conservation, Cultivated lands.
Identifiers: *Environmental Impact Statements, *Burleigh Co.(N.D.).

A resource conservation and development project in North Dakota will reduce flooding on about 2,500 acres of agricultural land and on a sparsely settled rural residential area. The improvements consist of floodwater diversion, dikes, grade control structure, a structure to divert low flows to Burnt Creek, and an inverted siphon to carry irrigation water across the diversion. The project will destroy 25 acres of vegetation and herbaceous cover, but five acres of similar land will be dedicated. The project will also provide for the maintenance of the integrity of the existing Burnt Creek channel and for use of the flood diversion berm and dikes by wildlife. Practically all the land in the watershed is privately owned and used for agriculture. Five-hundred additional acres of cropland will be irrigated after the project. There are no developed public recreation facilities in the area nor are there any private lands for this purpose. Crops have been damaged by floods in the area for the last thirty-one years. In addition to these summer rainstorm produced floods, spring snowmelt runoff causes additional problems by delaying land preparation for seeding. (Sperling-Florida)
W74-06002

LOUISIANA WETLANDS PROSPECTUS.
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
For primary bibliographic entry see Field 2L.
W74-06003

CIBOLO PROJECT, TEXAS.
For primary bibliographic entry see Field 6E.
W74-06004

WATER RESOURCES DEVELOPMENT--1973.
For primary bibliographic entry see Field 6E.
W74-06007

PUBLIC WORKS FOR WATER AND POWER DEVELOPMENT AND ATOMIC ENERGY COMMISSION APPROPRIATION BILL, 1974 PART 3.
For primary bibliographic entry see Field 6E.
W74-06008

AN ANALYTICAL INTERDISCIPLINARY EVALUATION OF THE UTILIZATION OF THE WATER RESOURCES OF THE RIO GRANDE IN NEW MEXICO: SOCORRO REGION,
New Mexico State Univ., University Park. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W74-06103

MULTIPLE PLANNING FOR MULTIPURPOSE WATER RESOURCE SYSTEMS: A STRUCTURE FOR REGIONAL WATER RESOURCE DEVELOPMENT,
INTASA, Menlo Park, Calif.
For primary bibliographic entry see Field 6B.
W74-06106

TOMORROW'S ENVIRONMENTAL BENEFIT-COST ANALYSIS,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 6G.
W74-06115

BUFFALO HARBOR, NEW YORK (MAINTENANCE), (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District. Buffalo, N.Y.
For primary bibliographic entry see Field 8A.
W74-06197

STEADY-STATE PATTERNS OF RAINWATER SEEPING THROUGH BEDDED SOIL WITH AND WITHOUT TILE DRAINS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W74-06257

MAGNITUDE AND FREQUENCY OF FLOODS IN ILLINOIS,
Geological Survey, Champaign, Ill.
For primary bibliographic entry see Field 2E.
W74-06271

FLOOD PRONE AREAS IN THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W74-06275

KILLER FROM THE BOTTOM OF THE SEA,
E. P. Weigel.
NOAA, Vol 4, No 1, p 30-35, January 1974.

Descriptors: *Tsunamis, *Warning systems, Flood forecasting, Waves(Water), Ocean waves, Earthquakes.

On September 16, 1973, the National Weather Service accepted responsibility for the U.S. Tsunami Warning System. Tsunamis are ocean waves generated by underwater disturbances in the earth's crust--usually earthquakes but sometimes submarine volcanic eruptions. The waves speed silently across the open sea at up to 600 miles an hour and sometimes wreak havoc on coastal areas thousands of miles away. The warning system is based on, first, the detection and pinpointing of an earthquake big enough and in the right place to cause a tsunami and, second, the identification by tide gages of ocean waves generated by that earthquake. A tsunami watch is issued when the proper-category earthquake is detected. A tsunami warning is issued when the presence of seismic sea waves is confirmed. Included in the warning are quite precise forecasts of arrival times for the first wave of the tsunami at populated points in and around the Pacific basin. (Knapp-USGS)
W74-06286

NUMERICAL SIMULATION OF TSUNAMIS,
Hawaii Inst. of Geophysics, Honolulu.
C. L. Mader.
Report HIG-73-3 (NOAA-JTRE-85), February 1973. 48 p, 30 fig, 10 tab, 9 ref, 2 append.

Descriptors: *Tsunamis, *Mathematical models, *Simulation analysis, Barriers, Ocean waves, Beaches, Waves(Water), Earthquakes, Computer programs.

Two-dimensional, time-dependent, nonlinear, incompressible, viscous flow calculations were used to form realistic models of tsunami waves interacting with continental slopes and shelves. Wave heights grow by a factor of 4 as they shoal up a 1/15 continental slope. The second or third wave often exhibits the largest wave runup. In comparisons with shallow water, long wave calculations show similar results except for short wavelength tsunamis. The damping action of submerged barriers on tsunami waves was also investigated. Significant amounts of the energy of a tsunami may be reflected by submerged barriers. Numerical simulation of tsunami waves can provide realistic descriptions of their flow. (Knapp-USGS)
W74-06297

LEACHING OF SALINE SOILS WITH DIFFERENT TYPES OF DRAINAGE (PROMYVKA ZASOLENNYKH POCHV PRI RAZLICHNYKH VIDAKH DRENAZHA),
For primary bibliographic entry see Field 2G.
W74-06302

ASYNCHRONOUS LONG-PERIOD STREAMFLOW FLUCTUATIONS IN THE EUROPEAN USSR (ASINKHRONNOST' MNOGOLETNIKH KOLEBANIY STOKA REK YEVROPEYSKOY TERRITORII SSSR),
For primary bibliographic entry see Field 2E.

W74-06305

BIONOMICS AND INTEGRATED CONTROL OF PLANT PARASITIC NEMATODES,
Agricultural Research Service, Beltsville, Md. Plant Science Research Div.
For primary bibliographic entry see Field 5B.
W74-06336

APPROXIMATE SOLUTION FOR UNCONFINED SEEPAGE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. S. Desai.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 99, No IR1, p 71-87, March, 1973. 12 fig, 24 ref.

Descriptors: *Drainage, *Finite element analysis, *Free surfaces, Interfaces, Irrigation, Numerical analysis, *Seepage, Transition flow, Unsteady flow.

An approximate solution procedure using the finite element method is developed for one-dimensional unstready free surface seepage. The numerical results are compared with experiments on a viscous flow model and with analogue solutions. Satisfactory correlation is obtained between the numerical and experimental results. Results from the proposed procedure based on one-dimensional formulation are compared with those from two- and three-dimensional formulations. Numerical properties of the proposed procedure with respect to timewise and spatial discretizations, magnitudes of permeability, and use of higher order approximating functions are analyzed. The proposed solution can provide satisfactory and economical solutions for many practical problems that can be idealized as one-dimensional. (Skogerboe-Colorado State)
W74-06338

PHYSICAL MODEL STUDY OF BORDER-STRIP IRRIGATION,
For primary bibliographic entry see Field 3F.
W74-06340

THEORETICAL IRRIGATION TAILWATER VOLUMES,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 3F.
W74-06347

PREFABRICATED FILTER-FIN FOR SUBSURFACE DRAINS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
K. A. Healy, and R. P. Long.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 98, No IR4, p 543-552, December, 1972. 5 fig, 1 tab, 5 ref.

Descriptors: *Drainage, *Drainage practices, Drainage systems, *Filters, Drainage engineering, Tile drainage, Subsurface drainage, Drains, Filtration, Seepage, Slope stabilization.
Identifiers: Fins, Underdrains.

The design and methods of installation of a prefabricated filter media for use with subsurface drains are presented. The filter media is fabricated from synthetic materials and can be used without special backfill. Methods of installing the prefabricated system in trenches and slopes are described. Results are presented from five field test installations containing a total length of 2,500 feet (762 m) of prefabricated underdrain. Costs for the underdrains are shown, and potential economics for slope stabilization and land drainage are indicated. (Skogerboe-Colorado State)
W74-06348

ERTS-1 APPLICATIONS IN HYDROLOGY AND WATER RESOURCES,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W74-06362

NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM--SNOW ACCUMULATION AND ABLATION MODEL,
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 2C.
W74-06370

AREAL SNOW COVER OBSERVATIONS IN THE CENTRAL ROCKIES, COLORADO,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W74-06391

RIVER BASIN PLANNING AND THE FOREST INDUSTRY--COMPROMISE OR CONFLICT,
Saint John River Basin Board (New Brunswick).
For primary bibliographic entry see Field 6B.
W74-06398

SEQUENTIAL DETERMINISTIC OPTIMIZATION IN RESERVOIR OPERATION,
Iowa Univ., Iowa City Inst. of Hydraulic Research.
T. E. Croley, II.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY3, Proceedings paper No 10426, p 443-459, March 1974. 4 tab, 21 ref. NSF GK-11564.

Descriptors: *Reservoir operation, *Optimization, *Computer models, *Dynamic programming, Methodology, Hydraulics, *Simulation analysis, Economics, Equations, Mathematical models, Systems analysis, Reservoir storage, Data processing.
Identifiers: Computation, Statistical analysis, *Deterministic optimization, Search techniques.

Computer simulation plays a weighty role in the optimum planning and operation of reservoir systems. As planning and operating needs for more complex systems grow, the demand on computational facilities increases. Reduction of computation in reservoir operation optimization problems can be made through a modification of the optimization technique rather than through limiting the development of the system models. Considerations are presented which lead to the development of a modified application of deterministic optimization techniques; the modification, optimization over reduced operation horizon at each stage, allows for reduction of computation without simplifying the problem while achieving results that approximate the optimum. In addition, these considerations result in several specific advantages associated with particular optimization techniques. Insight is given into these considerations, and resulting modifications to be made to applications of optimization techniques are presented. In an example problem, the modified application of dynamic programming is made for a single reservoir system illustrating the technique and the achievement of near optimum performance. (Bell-Cornell)
W74-06416

ALTERNATIVE WATER RESOURCE SYSTEMS IN THE LOWER MEKONG,
Economic Commission for Asia and the Far East (UN), Bangkok (Thailand). Mekong Committee Secretariat.
K. Chaemsaithong, L. Duckstein, and C. C. Kisiel.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY3, Proceedings paper No 10430, p 461-475, March 1974. 3 fig, 2 tab, 28 ref.

Descriptors: *Evaluation, *Decision making, *Alternative planning, *Water resources development, *Flood control, *Hydroelectric power, *Agriculture, Costs, Environment, Systems analysis, Mathematical models, Irrigation.
Identifiers: Cost-effectiveness, Sensitivity analysis, Economic analysis, *Mekong River Basin, Developing countries, Uncertainty, Impact, Systems engineering.

The particular problems of water resource system design in developing countries are illustrated through presentation of a systematic method to evaluate alternative water resources systems, using a central portion of the Lower Mekong Basin as an example. The method is Kazanowski's cost-effectiveness approach, used here to evaluate two alternative water resource systems designed to reach social and economic goals. The fallacies encountered in benefit-cost analysis are given, and the advantages of Kazanowski's method are discussed and the approach is outlined in 10 steps. These 10 steps are then discussed in detail in applying the method to the Lower Mekong Basin. In the evaluation process, the development goals that may be of an economic or social nature are stated explicitly and are transformed into specifications. The approach requires that distinct alternatives be sought and compared using both quantitative and qualitative criteria. The alternative systems for the Lower Mekong Basin are defined as systems consisting of structural projects, such as dams and reservoirs including spillways, powerhouses, dikes, and irrigation systems at different locations. A decision to select an alternative can be reached by use of a fixed-cost or fixed-effectiveness approach. Sensitivity analysis in the approach accounts for uncertainty in hydrologic and economic data. (Bell-Cornell)
W74-06418

THE HYDROLOGICAL EVALUATION OF REGIONAL WATER-RESOURCE SYSTEMS IN THE UNITED KINGDOM,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 6B.
W74-06421

THE OPTIMUM DEVELOPMENT OF WATER RESOURCES IN A RURAL SETTING,
North Dakota State Univ., Fargo.
D. O. Anderson.
In: Proceedings (Vol III), The International Symposium on the Planning of Water Resources, Mexico City, December 4-8, 1972. 46 p, 8 fig, 2 tab.

Descriptors: *River basin development, *North Dakota, *Rural areas, Methodology, Long-term planning, *Comprehensive planning, *Linear programming, Water supply, Optimization, Alternative planning, Economic efficiency, Agriculture, Systems analysis, Mathematical models, *Optimum development plans.
Identifiers: *Knife River Basin(N. Dak), Separable programming.

Presented are two methodological approaches to water and related land resources planning with specific application to rural America. Considered is the adoption of a progressive water plan and development program for optimum utilization of water resources in North Dakota, known for its wide fluctuations in economic activity, climate and social structures. The optimum plan must consider simultaneously all physical, economic, legal, environmental, and social characteristics and goals, possessing the flexibility for continual revision as changes occur. The Knife River Basin, an area devoted chiefly to farming and ranching, was chosen for study. The first of the two methodological approaches is a mathematical model which combines linear and separable programming. Since water supply is the most limiting natural resource, the optimum development plans maximize returns to water, and the problem becomes one of determining the combination of dams, pumps, and other

structures along with the most profitable uses that would give the greatest net dollar benefit from water available in the Basin. The second approach, a people-oriented systems design, is an effective methodology for the formulation of plans to develop and manage water resources for hydrological areas of various sizes and for bringing together the expertise of a wide range of disciplines to solve complex problems. Solution is accomplished by systematic assembly and matching of knowledge on all parameters of the problem in order to solve the entire problem simultaneously. (Bell-Cornell)
W74-06422

DRAINING AND RECLAMATION OF SWAMPY FOREST LANDS, (IN RUSSIAN),
M. M. Elpat'evskii, M. P. Elpat'evskii, and V. K. Konstantinov.
Lesnaya promyshlennost': Moscow. 1970. 232 p. Illus.
Identifiers: *Forest planting, *Swampy lands, *Drainage, *Land reclamation.

The characteristics of the total forest area intended for ameliorarion, the condition and the prospects of forest draining development are presented. The experience of advanced farms and those in other countries, the methods and the evaluation of forest draining efficiency are described. Data are given on the draining of cutting areas. Norms of draining, and problems of fertility of swampy soils and the causes of the absence of forests on swamps are also presented. The principles of agricultural technique and technology are examined for the reclamation of swamps by forest planting.--Copyright 1973, Biological Abstracts, Inc.
W74-06439

IMPACTS OF INDUCED RAINFALL ON THE GREAT PLAINS OF MONTANA.
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 3B.
W74-06442

ECOLOGICAL IMPACTS: PART 1--RANGE AND RANGE LIVESTOCK PRODUCTION,
Montana State Univ., Bozeman. Dept. of Animal and Range Sciences.
For primary bibliographic entry see Field 3B.
W74-06443

ECOLOGICAL IMPACTS: PART II--WILDLIFE AND BIOCOMMUNITIES,
Montana State Univ., Bozeman. Dept. of Animal and Range Sciences.
For primary bibliographic entry see Field 3B.
W74-06444

WATER QUALITY EFFECTS OF SEEPAGE FROM EARTHEN DAMS,
Geological Survey, Prescott, Ariz.
For primary bibliographic entry see Field 5B.
W74-06453

A PRELIMINARY ASSESSMENT OF SNOWFALL INTERCEPTION IN ARIZONA PONDEROSA PINE FOREST,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2C.
W74-06455

PROBLEMS AND IMPLICATIONS IN THE DEVELOPMENT OF ARID LANDS,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W74-06465

THE CHANGING ROLE OF WATER IN ARID LANDS,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 6B.
W74-06466

ON THE CAUSES OF ARIDITY ALONG A SELECTED GROUP OF COASTS,
Wisconsin Univ., Milwaukee. Dept. of Geography.
For primary bibliographic entry see Field 2B.
W74-06469

COASTAL DESERTS OF THE OLD WORLD AND THEIR RECLAMATION,
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
L. E. Rodin.
In: Coastal Deserts, their natural and human environments, ed. by D. H. K. Amiran and A. W. Wilson. University of Arizona Press, Tucson, 1973, p 157-158. 1 tab, 13 ref.

Descriptors: *Arid lands, *Agriculture, *Deserts, *Land reclamation, *Trenches, Saline soils, Reclamation, Arable lands, Land development, Leaching, Land resources, Desert plants, Humidity, Soil moisture, Soil types, Sands, Drainage.
Identifiers: USSR, Egypt, India.

Five fundamental desert regions of the Old World are identified in the USSR, Egypt, and India, where annual precipitation varies from 21 mm (Suez) to 347 mm (Bhuj, India). Sand and solonchaks, described as the two predominant soil types in these coastal deserts, are contrasted by comparing the predominant vegetation types of each of these soils. Due to their coastal location these deserts experience high atmospheric moisture conditions on their seaward areas. This seems to be the primary contribution to soil moisture in many areas. Trees that can be grown successfully under these conditions in each desert are listed. Groundwater availability is also discussed. The reclamation of these desert soils for agriculture has potential for product yield increase. The mineral or salinity control of the solonchak soils is necessary for their successful reclamation by making the fresh groundwater horizon accessible to the root systems. The USSR's 'trench farming' method to achieve this is described. The crops which may be cultivated in such areas are listed. (Muller-Arizona)
W74-06479

CLIMATIC-GEOMORPHOLOGICAL ZONES AND LAND UTILIZATION IN THE COASTAL DESERTS OF THE NORTH SAHARA,
Stuttgart Univ. (West Germany). Geographisches Institut.
W. Meckelein.
In: Coastal Deserts, their natural and human environments, ed. by D. H. K. Amiran and A. W. Wilson. University of Arizona Press, Tucson, 1973, p 159-165. 1 fig, 1 tab, 14 ref.

Descriptors: *Arid climate, *Climatic zones, *Coasts, *Land use, Land classification, Land resources, Land management, Regional economics, Topography, Precipitation(Atmospheric), Deserts, Semiarid climates, Soils, Geomorphology.
Identifiers: *Shara Desert.

In the northernmost extent of the Sahara Desert bordering on the Mediterranean Sea, from Tunisia to Egypt, three climatic meteorological zones are apparent. The first occupies part of the Tunisian and Tripolitanian Jebel, with over 300 mm per year precipitation on terra rossa soils. The second zone is transitional between the Mediterranean climate of the first zone and the subtropical dry climate of the third, with 200 mm per annum or less precipitation. The semidesert climate of the third zone is the last area in which the influences of the Mediterranean Sea may be observed. Present land utilization is as diverse as the land, with agriculture and animal husbandry predominating. The potentials for food producing land utilization are discussed for each of the zones. The importance of using geographical methods in order to recognize the combination of natural factors in an arid region which influence land utilization is stressed. The optimization of returns from agriculture and animal husbandry is dependent on the extent to which these interrelationships are realized and accommodated. (Muller-Arizona)
W74-06480

THE CRISIS OF THE SAHARAN OASES,
Paris Univ. (France). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W74-06481

EILAT: SEASIDE TOWNS IN THE DESERT OF ISRAEL,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W74-06482

THE UTILIZATION OF THE NAMIB DESERT, SOUTHWEST AFRICA,
California Univ., Los Angeles. Dept. of Geography.
R. F. Logan.
In: Coastal Deserts, their natural and human environments, ed. by D. H. K. Amiran and A. W. Wilson, University of Arizona Press, Tucson, 1973, p 177-186. 5 fig, 9 ref.

Descriptors: *Regional economics, *Marginal productivity, *Water supply, *Fogs, Mining, Grazing, Tourism, Water resources, Coasts, Natural resources, Fishing, Arid climates, Arid lands, Precipitation(Atmospheric), Climate, Urbanization, Transportation, Harbors, Regional development.
Identifiers: *South Africa, *Angola.

The Namib Desert occupies the southwest coast of Africa from Mossamedes in Angola to the Olifants River of South Africa, but extends only about 100 miles inland. It is made up principally of large sand plains with gravel or bedrock flats, and bare rock mountains. The climate is cool and the humidity high, with coastal fogs common, but the land is almost completely rainless. The area has been traditionally inhabited by tribes of bushmen, but modern man is making inroads into the region. Fisheries are established along the coast, with their associated industries and ports (of which one is capable of handling oceangoing vessels). Urbanization has occurred in conjunction with these ports. Diamond mining, salt production, cattle and sheep grazing, tourism, and extremely limited agriculture are currently the foundations of the economy. Water is available only as underflow in the sands of streams and riverbeds. Up to now, this has been sufficient for the small-scale farming which is carried on in two locations. While the Namib appears to offer little potential for future development, fishing and port commerce plus a growing tourism can create substitutes for a dangerous encouragement toward marginal agricultural development dependent on an uncertain and inadequate water supply. (Muller-Arizona)
W74-06483

ECONOMIC DEVELOPMENT OF THE AUSTRALIAN COASTAL DESERTS,
Western Australia Univ., Nedlands.
For primary bibliographic entry see Field 6B.
W74-06484

MANAGEMENT OF PROTECTION FORESTS IN WESTLAND,
New Zealand Forest Service, Hokitika.
M. F. O'Reilly.

N Z J For. Vol 17, No 2, p 274-279, 1972. Illus.
Identifiers: *Erosion, Floods, *Forest management, Mountains, *New Zealand(Westland), *Soil stabilization, Coastal plains.

Over 60% of the total land area of Westland, New Zealand, is mountainous country bordering the narrow coastal plain. The mountains rise to heights of 1200 to 3650 m in as little as 12 km from the sea. Over 30 major rivers run down through the coastal plain. These mountains are largely forest-clad up to about 1000 m. The forests and other vegetation are subject to damage from browsing and grazing animals and, to a less extent, fire. The prime objective of management must be to stabilize mountain soils and regulate river flows, to minimize flood and erosion damage to downstream areas. Management for scenic, tourist and recreational use is becoming an increasingly import secondary objective. Thus, while the forest must be maintained in a condition in which they can fulfill their primary protective function most efficiently, their value as scenery, and their use for recreation and sport must be considered. In addition, the role of commercial meat hunters in contributing towards animal control must also be taken into account. It is important that the primary objective does not become obscured because of pressure from sectional groups in their own particular interest.--Copyright 1973, Biological Abstracts, Inc.
W74-06488

4B. Groundwater Management

A MULTILAYER AQUIFER MODEL OF THE OGALLALA FORMATION IN OKLAHOMA,
Oklahoma State Univ., Stillwater.
For primary bibliographic entry see Field 2F.
W74-05962

ON WATER RESOURCE CONDITIONS IN THE VICINITY OF PINELLAS COUNTY'S ELDRIDGE WILDE WELL FIELD,
Southwest Florida Water Management District, Brooksville.
G. Parker.
Hydroscope, Vol 4, No 4, May/June 1973. 4 p, 8 fig, 1 map.

Descriptors: *Water wells, *Subsurface waters, *Aquifer systems, *Aquifer management, Water sources, Water storage, Groundwater, Groundwater recharge, Saline water intrusion, Subsurface investigations, Natural recharge, Potentiometric level, Florida, Water resources, Dredging, Pumping, Irrigation, Water levels.

Pinellas County's Eldridge Wilde Well Field consists of about 2.8 square miles of land in northeastern Pinellas County and northwestern Hillsborough County, Florida. When put into service in 1956 its average pumpage was 5.7 million gallons per day (mgd), but with rapidly expanding water demands, the average pumpage had risen to 43.56 mgd in May, 1973. The largest customers are the cities of Clearwater, Tarpon Springs, Largo, Safety Harbor, and Pinellas Park. The average direct recharge to the aquifer is about .650 mgd per square mile; it requires 65.5 square miles of land to supply the current average-day's pumping. This is an area almost 23 1/2 times larger than the existing field. This pumping has created a widespread cone-of-depression around the well field. Drought effects are a principal cause of lowered waters since during dry periods most water pumped is used for irrigation. The current drought is the worst recorded in the area with below average rainfall in ten of the last twelve years. The other major cause of water level lowering is the dredging of both natural streams and man-made channels, which also cause saltwater intrusion. (McKnight-Florida)
W74-06232

ALLUVIAL GROUND WATER QUALITY ALTERATION AS RELATED TO SOLID WASTE DISPOSAL SITES IN IOWA, PART I: TEXT; PART II: APPENDIX,
Iowa State Univ., Ames. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W74-06256

GEOPHYSICAL INVESTIGATIONS OF WASHINGTON'S GROUND WATER RESOURCES,
Washington State Univ., Pullman. Coll. of Engineering.
For primary bibliographic entry see Field 2F.
W74-06262

GEOLOGY AND WATER RESOURCES OF EASTERN PART OF JUDITH BASIN, MONTANA,
Geological Survey, Billings, Mont.
For primary bibliographic entry see Field 2F.
W74-06263

EFFECTS OF WELL INJECTION ON A BASALTIC GHYBEN-HERZBERG AQUIFER,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W74-06264

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS: PART 1. SOURCE IDENTIFICATION AND EVALUATION.
For primary bibliographic entry see Field 5B.
W74-06277

INVESTIGATIONS--GEOLOGY AND GROUNDWATER RESOURCES, VICINITY OF CASTLE ROCK, COWLITZ COUNTY, WASHINGTON,
Washington State Dept. of Ecology, Olympia. Office of Technical Services.
C. Cline.
Technical Report 73-010, July 1973. 9 p, 4 fig, 1 ref.

Descriptors: *Aquifer testing, *Water yield, *Washington, Hydrogeology, Drawdown, Specific capacity, Alluvium, Sandstones, Groundwater, *Pumping.
Identifiers: Kelso(Wash).

A pumping test was made on a well soon to be destroyed because of a planned right-of-way to Interstate Highway 5 near Kelso, Washington. The well produced water from the Eocene sandstone. It was drilled to 163 feet in July of 1949 and was cased to 54 feet. A bailer test made at that time could yield only 6 gpm over a 1-1/2 hour period. The specific capacity of the well is approximately 0.06 gallons per minute per foot of drawdown. The bailer test conducted by the driller on the replacement well indicates that 50 gpm could be pumped from this well with only a 17 foot drawdown after pumping for two hours. (Knapp-USGS)
W74-06278

OBSERVED CHANGES IN GROUNDWATER REGIME CAUSED BY THE CREATION OF LAKE DIEFENBAKER, SASKATCHEWAN,
Department of the Environment, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 2F.
W74-06291

HYDROLOGY OF BASALT AQUIFERS AND DEPLETION OF GROUND WATER IN EAST-CENTRAL WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2F.
W74-06311

GROUNDWATER MANAGEMENT,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
H. J. Peters.
Water Resources Bulletin, Vol 8, No 1, p 188-197, February, 1972. 1 fig.

Descriptors: *Water management(Applied), *Surface-groundwater relationships, *Groundwater resources, Groundwater potential, Water utilization, Aquifer management, Base flow, Groundwater, Surface water, *Conjunctive use.

Groundwater management concepts have changed over the years, with today's concept a comprehensive integrated use of the four groundwater resources with surface water resources to provide the most efficient water service for an area in terms of quantity, quality, and cost. Complete geologic and hydrologic understanding provides a base for formulation of plans which can utilize the techniques of artificial recharge, control of sea water intrusion, and variation of pumping patterns while protecting the resources through proper well construction and abandonment, placement of sanitary landfills, and liquid waste disposal. Plan formulation involves varying recharge and extraction amounts while maintaining the total of pumped groundwater and developed surface water equal to the projected demand. Physical limitations of the system must be recognized to assure reality of the plans. Legal constraints should not be placed on the plan formulation process. A present worth or other technique is used to provide an economic comparison among plans. Implementation will entail development of legal and organizational structures, with the most difficult problems relating to the management organization in terms of boundaries and powers. (Skogerboe-Colorado State)
W74-06334

TENSIOMETER USE IN SHALLOW GROUNDWATER STUDIES,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
S. J. Richards, L. S. Willardson, S. Davis, and J. R. Spencer.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 99, No IR4, p 457-464, December, 1973. 7 fig, 7 ref.

Descriptors: *Drainage, *Groundwater, Measurement, Piezometers, Pore water, Pore pressure, Seepage, *Tensiometers, *Water table, Wells.

Tensiometers installed with a ground surface or other reference can be used to determine groundwater equipotentials and the position of the water table in the field. Tensiometer determined water tables were roughly comparable to those measured with perforated wells in a sprinkler irrigated Coachella fine sandy soil. Water differences depended on the flow conditions and proximity of the tensiometers to a drain. Shallow groundwater equipotentials can be determined above and below the water table with a tensiometer system. (Skogerboe-Colorado State)
W74-06343

ELECTRICAL ANALOG MODEL STUDY OF THE ALLUVIAL AQUIFER IN THE YABUCOA VALLEY, PUERTO RICO: PHASE 2--THE PLANNING, CONSTRUCTION AND USE OF THE MODEL,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 2F.
W74-06351

THE CITY OF FRESNO'S LEAKY ACRES GROUND-WATER RECHARGE PROJECT--CONSTRUCTION AND PERFORMANCE,
Agricultural Research Service, Fresno, Calif. Ground Water Recharge Field Station.
W. C. Bianchi, and G. J. Lang.

Journal of the American Water Works Association, Vol 66, No 3, p 176-180, March 1974. 8 fig, 4 tab, 3 ref.

Descriptors: *Water spreading, *Artificial recharge, *California, Water treatment, Hydrogeology, Alluvium, Cities, Urbanization, Irrigation practices.
Identifiers: *Fresno(Calif).

The urban-area hydrology and geologic setting of Fresno, Calif., produces groundwater depressions that require stabilization. Artificial groundwater recharge by water spreading on selected agricultural soils can be operationally and economically successful for urban water supply. Construction, structures, and water-control operations are closely related to agricultural irrigation practice. Artificial recharge can be accomplished into the Fresno depression at a total cost of $25.00-$25.50/acre-ft (at the mains) by water spreading in the urbanized area. This is about half of what filtration and treatment would cost. The actual cost of water spreading amounts to only $2.50-$3.00/acre-ft, with the rest going to water purchase and pumping costs to put the water into the city's mains. (Knapp-USGS)
W74-06358

WATER-QUALITY ASPECTS OF GROUND-WATER RECHARGE IN ISRAEL,
Ministry of Agriculture, Tel-Aviv (Israel). Water Pollution Control Univ.
For primary bibliographic entry see Field 5D.
W74-06363

RENOVATING MUNICIPAL WASTEWATER BY HIGH-RATE INFILTRATION FOR GROUND-WATER RECHARGE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5D.
W74-06364

CHEMICAL POLLUTION OF GROUND WATERS,
For primary bibliographic entry see Field 5B.
W74-06365

WATER QUALITY AND OTHER ASPECTS OF GROUND-WATER RECHARGE IN SOUTHERN CALIFORNIA,
Toups Engineering, Inc, Santa Ana, Calif.
For primary bibliographic entry see Field 5B.
W74-06366

NITRATES AND GROUND-WATER MANAGEMENT IN THE FRESNO URBAN AREA,
For primary bibliographic entry see Field 5B.
W74-06367

PROBLEMS OF WATER-QUALITY STANDARDS IN THE MANAGEMENT OF GROUND-WATER BASINS,
Pomeroy, Johnston and Bailey, Pasadena, Calif.
For primary bibliographic entry see Field 5B.
W74-06368

SUMMARY OF WATER-LEVEL AND PUMPAGE DATA IN THE CHEYENNE AND FEDERAL MUNICIPAL WELL FIELDS, APRIL 1, 1972 TO APRIL 2, 1973, CHEYENNE, WYOMING,
Geological Survey, Cheyenne, Wyo.
B. H. Ringen.
Basic-data report, October 1973. 27 p, 11 fig.

Descriptors: *Water levels, *Water yield, *Groundwater, *Wyoming, Hydrologic data, Data collections.
Identifiers: *Cheyenne(Wyo).

Water-level data were collected April 1, 1972 to April 2, 1973 for the Cheyenne and Federal municipal well fields by the U.S. Geological Survey, in cooperation with the city of Cheyenne. Pumpage data for these well fields, April 1, 1972 through March 31, 1973, were provided by the city of Cheyenne. Water levels were measured monthly in selected wells in the Cheyenne and Federal municipal well fields. In addition, graphic water-stage recorders were operated on three observation wells in the Cheyenne municipal well field. (Knapp-USGS)
W74-06369

THE CONTENT OF SOME NATURAL RADIOACTIVE ELEMENTS, ESPECIALLY RN-222, IN SOME POTABLE WATERS IN SWEDEN,
National Inst. of Radiation Protection, Stockholm (Sweden).
For primary bibliographic entry see Field 2K.
W74-06372

INVESTIGATIONS--GROUND WATER CONDITIONS IN THE VICINITY OF PLAZA, SPOKANE COUNTY, WASHINGTON,
Washington State Dept. of Ecology, Olympia. Office of Technical Services.
P. A. Eddy.
Technical Report 73-008, June 1973. 9 p, 2 fig, 1 tab, 3 ref.

Descriptors: *Groundwater, *Loess, *Washington, *Glacial drift, Aquifer testing, Water yield, Water quality.
Identifiers: *Spokane County(Wash).

Groundwater conditions were studied near Plaza, Spokane County, Washington, to ascertain the availability of groundwater. A pump test was conducted to obtain specific information about one well's behavior. Water samples were collected for quality analysis. The two geologic units which are of primary interest are the eolian deposits and the scabland deposits. In general, the water-bearing characteristics of these units are fairly predictable and are determined by primary properties such as grain size and rock type. A real differences are caused by secondary properties such as the degree of compaction, cementation, weathering, and erosion. The porosity of the loess is high and, where saturated, it contains large volumes of water. However, the hydraulic conductivity is low. Scabland deposits are gravels, sands, and silts of glaciofluvial origin. This unit lies directly on the basalt and has good hydraulic conductivity. Over the 2-hour pump test, the well yield was approximately 600-650 gallons. Based on a need of 200 gallons per day per person in the household, this well will produce the amount required (600 gallons per day for a 3 member family) over a 24-hour period. (Knapp-USGS)
W74-06436

HYDROLOGY IMPACTS: PART I--GROUND WATER HYDROLOGY,
Montana State Univ., Bozeman. Dept. of Sociology.
For primary bibliographic entry see Field 3B.
W74-06446

ARTIFICIAL RECHARGE OF GROUNDWATER BY LOCAL SURFACE RUNOFF (ISKUSSTVENNOYE VOSPOLNENIYE ZAPASOV PODZEMNYKH VOD ZA SCHET MESTNOGO POVERKHNOSTNOGO STOKA),
Voronezhskii Selskokhozyaistvennyi Institut (USSR).
V. M. Smol'yaninov.
Vestnik Moskovskogo Universiteta, Seriya V, Geografiya, No 2, p 106-112, March-April 1972. 5 fig, 3 tab, 12 ref.

Descriptors: *Artificial recharge, *Groundwater recharge, *Groundwater, *Surface runoff, Hydrogeology, Aquifers, Recharge wells, Seepage.
Identifiers: *USSR(European region).

Artificial replenishment of groundwater storage by regulation of local runoff was investigated in central Chernozem regions of the European USSR. The most importan hydrogeological characteristics determined were thickness and permeability of the zone of aeration, location of the upper aquifer, and direction and rate of groundwater movement. A part of the local surface runoff in central Chernozem regions and in many regions in the European south of the USSR can be used as the primary source for artificial recharge, and the gully-ravine network can serve for building seepage reservoirs. To study artificial recharge conditions over large expanses, the method of representative areas can be used. This method includes a geological, geomorphological, and hydrogeological regionalization, selection of representative areas on the basis of geomorphological, hydrogeological, and hydrologic characteristics, and observations in the areas selected. Recommendations on location and operation of wells in artificially replenished groundwater areas are tabulated. (Josefson-USGS)
W74-06450

DISTINCTIVE HYDROGEOLOGICAL CHARACTERISTICS OF SOME PAMPAS OF THE PERUVIAN COASTAL REGION,
Sao Paulo Univ. (Brazil). Dept. of Geology.
P. Taltasse.
In: Coastal Deserts, their natural and human environments, ed. by D. H. K. Amiran and A. W. Wilson. University of Arizona Press, Tucson, 1973, p 109-110. 4 ref.

Descriptors: *Hydrogeology, *Groundwater, *Aquifers, *Coastal plains, Groundwater availability, Alluvial aquifers, Aquifer systems, Areal geohydrology, Subsurface water, Wells, Water sources, Reservoirs, Recharge, Water storage, Water supply, Water table, Aquifers, Groundwater basins, Hydrologic aspects, Springs, *Grasslands.
Identifiers: *Peru.

The coast of Peru from the Sechura desert to the valley of the Rio Yauca is occupied by a sedimentary plain known as the pampas. Recently groundwater aquifers have been discovered in this area. Wells with relatively high yields have been established in the pampas for agriculture. These initial holes indicate that a more extensive groundwater system may exist under the pampas, and that some of the aquifers discharge into faulted complexes of metamorphic rocks. The actual extent of this aquifer is not known nor is there an estimate of the amount of water stored, but if the preliminary findings are indicative, the groundwater of the area will be a significant input into the agriculture of the region in terms of increased economic returns. (Muller-Arizona)
W74-06472

4C. Effects On Water Of Man'S Non-Water Activities

HIGHWAYS AND ENVIRONMENT,
Oregon State Highway Div., Salem. Environmental Section.
For primary bibliographic entry see Field 6G.
W74-06114

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE DALLAS, TEXAS METROPOLITAN AREA, 1971,
Geological Survey, Austin, Tex.

For primary bibliographic entry see Field 2A.
W74-06288

IMPACT OF MINING GRAVEL FROM URBAN STREAM BEDS IN THE SOUTHWESTERN UNITED STATES,
Arizona Univ., Tuscon. Dept. of Geosciences.
W. B. Bull, and K. M. Scott.
Geology, Vol 2, No 4, p 171-174, April 1974. 3 fig, 1 tab, 14 ref.

Descriptors: *Alluvial channels, Gravels, *Sands, *Quarries, *Urban hydrology, Scour, Stream erosion, Construction materials, Channel morphology, *Southwest U.S.
Identifiers: Urban streambeds, *Gravel mining.

Large amounts of sand and gravel are excavated from stream channels, which are a convenient source of high-quality aggregate. Such mining has a potential impact both on the stream system from which the gravel is taken and on engineering structures in the vicinity of the stream. Urbanization changes the rates at which water flows into stream channels and affects the erosion of soils that furnish the suspended load and bed load. The net effect of these activities in many southwestern cities is to increase flood peaks, decrease low-flow discharges, and increase sediment loads greatly during periods of community construction. Although the mining of sand and gravel in stream channels causes minimal changes in water and sediment discharge, several other effects are common. The removal of sand and gravel from a streambed pit causes a local lowering of the streambed that results in overall downcutting of the channel upstream from the mining operation. When aggregate is removed from many locations along a stream, the removal of sand and gravel generally exceeds the rate of replenishment of sand and gravel from the urban and natural watershed. The consequent lowering of the streambed increases the potential for undermining bridge piers during times of major streamflow, when maximum scour occurs. Deepening of the stream channel as a result of gravel mining also tends to increase channel capacity, because more of a floodflow will remain in the channel after channel deepening than before. However, channel deepening also has the adverse effect of making the streambanks more susceptible to erosion. Streambed mining may reduce recharge to the groundwater table. (Knapp-USGS)
W74-06374

A LITERATURE REVIEW OF TIMBER-HARVESTING EFFECTS ON STREAM TEMPERATURES: RESEARCH NEEDS FOR THE SOUTHWEST,
Forest Service (USDA), Tempe, Ariz. Forest Hydrology Lab.
D. R. Patton.
USDA Forest Service Research Note RM-249, November 1973. 4 p, 26 ref.

Descriptors: *Water temperature, *Southwest U.S., Reviews, *Clear-cutting, *Cutting management, *Forest management, *Lumbering, Runoff, Watershed management, Environmental effects, Aquatic habitats, Water quality standards, Research priorities.
Identifiers: Fish habitats.

Literature on the effects of timber harvest on water temperature is reviewed. Water temperature affects fish by changing their metabolic rate, changing oxygen content of water, influencing hatching and development time, and influencing migration. Creating a more open forest in the water-producing zone can change water temperature in shallow, low-volume streams. Research is needed on how timber harvesting affects water temperature to produce guidelines to meet Federal Water Pollution Control standards for cold-water fish. (Knapp-USGS)
W74-06437

THE EFFECT OF LOGGING ON HILL DIPTEROCARP FOREST,
Forest Research Inst., Kepong (Malaysia). Colombo Plan.
P. F. Burgess.
Malay Nat J. Vol 24, No 3/4, p 231-237. 1971.
Identifiers: *Dipterocarp forests, Erosion, *Forests, Hills, Roads, Wildlife, *Lumbering.

The Malaysian rain forest is of so mixed a constitution that only a relatively small proportion is marketable. Of the 2500 species of trees there are only about 700 spp. which reach a size large enough for timber use. The trees which are felled are usually those with large crowns, which when they fall cause considerable damage to the lower stories of the forest. The greatest damaging factor in hill forest timber operations is probably road making. Erosion is extensive and records show that one area was scoured to a depth of 12 feet in one monsoon season. In some areas erosion causes extensive landslides. It has been estimated that 48% of the mammals move out of forests being logged. Scientific information is needed to determine the total extent to which logging affects different soil and topography types and to find the length of time during which this erosion continues.--Copyright 1973, Biological Abstracts, Inc.
W74-06454

4D. Watershed Protection

LITTLE CREEK WATERSHED PROJECT, LAURENS AND WHEELER COUNTIES, GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Athens, Ga.
Available from National Technical Information Service, Springfield, Va, 22151, as EIS-GA-73-0657-F, $4.00 in paper copy, $1.45 in microfiche. March 1973. 41 p, 3 map, 1 tab.

Descriptors: *Alternative planning, *Cost-benefit ratio, *Multiple-purpose projects, *Erosion control, *Georgia, Reservoirs, Construction, Project feasibility, Ecology, Waste disposal, Long-term planning, Irrigation, Environmental control, Agricultural engineering, Administration, Recreation facilities, Project planning, Recreation, Soil conservation, Farm ponds, Wildlife conservation, Land management, Economics.
Identifiers: *Environmental impact statements.

The final statement approves of the project, aimed at soil conservation, irrigation and recreational water supply and use. To implement the treatment program, the project proposes to construct 12 reservoirs for irrigation supply and 1 multiple use reservoir for recreation and irrigation use. The poor hydrologic condition in the area, sub-region 6, South Atlantic Gulf Coast Water Resources Region, is due primarily to overgrazing, poor harvesting, frequent burning and cultivation of these rural lands. The recreational opportunities are very limited. To be compatible with the environment and sound watershed management, dams, spillways and barrow areas will be vegetated with grass and legumes immediately after construction of the reservoirs. The reservoirs should reduce erosion, lead to new farm ponds which will furnish additional surface areas for recreational use and will possibly lead to waterfowl stimulus. Wastes will be disposed of in accordance with Georgia's state solid waste management rules. No known practical alternatives are available and the project should produce minimal adverse environmental effects which are listed. Appendix A shows a benefit cost ratio of 2.2:1 and Appendix B gives comment and suggestion letters from various state and federal agencies. (Sutton-Florida)
W74-05996

GROUND WATER PROBLEM AT NIOBRARA, NEBRASKA AND THE NIOBRARA STATE PARK (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Omaha, Neb.
For primary bibliographic entry see Field 4A.
W74-06001

PENDING WATERSHED PROJECTS.
For primary bibliographic entry see Field 6E.
W74-06196

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

LAKE ERIE, OHIO, PENNSYLVANIA, NEW YORK INTAKE WATER QUALITY SUMMARY, 1970.
Environmental Protection Agency, Chicago, Ill. Region V.
For primary bibliographic entry see Field 5B.
W74-05987

TRACE METALS IN THE NORTH SEA,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. W. R. Dutton, D. F. Jefferies, A. R. Folkard, and P. G. W. Jones.
Marine Pollution Bulletin, Vol 4, No 9, p 135-138, September 1973. 1 fig, 3 tab, 2 ref.

Descriptors: *Baseline studies, *Heavy metals, Surface waters, Chemical analysis, Marine algae, Trace elements, Zinc, Manganese, Nickel, Copper, Cadmium, Water analysis, Lead, Iron, *Spectrophotometry, *Pollutant identification, *Distribution.
Identifiers: Biological materials, *North Sea, Background levels, Biological samples, Atomic absorption spectrophotometry, Dissolved metals, Chemical concentration, Silver, Fucus vesiculosus, Porphyra umbilicalis, Patella vulgata.

The distribution of zinc, manganese, nickel, copper and cadmium in water and biological material has been measured in the southern North Sea and Straits of Dover, and off the north-east coast of England. Analyses were conducted by means of an atomic absorption technique. Zn, Mn, Cu, Ni, and Cd were measured in all samples. Fe was additionally analyzed in shoreline and biological samples; Pb and Ag were measured in the biological material only. With the exception of cadmium, the metals measured showed onshore-offshore gradients to varying degrees, the highest values generally occurring in the vicinity of estuaries. The concentration of cadmium varied between less than 0.1 and 1.4 micrograms/l but its distribution could not be contoured with any degree of confidence. These investigations provide values against which future pollution changes can be measured. (Holoman-Battelle)
W74-06011

TRACE METALS IN SEDIMENTS OF NEW YORK BIGHT,
Westchester Community Coll., Valhalla, N.Y. Dept. of Chemistry.
D. J. Carmody, J. B. Pearce, and W. E. Yasso.
Marine Pollution Bulletin, Vol 4, No 9, p 132-135, September 1973. 6 fig, 3 tab, 14 ref.

Descriptors: *Trace elements, *Bottom sediments, Chromium, Copper, Lead, Nickel, Zinc, *Waste disposal, *Heavy metals, Pollutant identification, Sewage sludge, Pollutants, Water pollution sources, Chemical analysis, Soil analysis, Aquatic soils, Solvent extractions, Methodology, Bottom sampling, *Spectrophotometry.

Identifiers: *New York Bight, Dredge spoils, Marine environment, Atomic absorption spectrophotometry.

Sediment samples from seventy-five stations around the waste disposal sites in the New York Bight were analyzed for the presence of Cr, Cu, Pb, Ni, and Zn. Twenty-five other sites in the Hudson Shelf Valley and in Delaware Bay were sampled for comparative purposes. A Smith-McIntyre bottom grab was used for sampling. Aliquots were removed, frozen, oven-dried at 105C, extracted in 8 N HN03 for 30 min, and filtered to a constant volume. The resulting solutions were analyzed by atomic absorption. There was a greater variation in heavy metal concentrations in and near the dumping areas than in the uncontaminated regions. In severely polluted areas, metal concentrations occasionally varied as much as 50 percent between subsamples taken from the same grab sample. On comparing metal concentrations at different depths to a depth of 15 cm, no consistent trend was discernible. (Holoman-Battelle)
W74-06012

MULTIELEMENT INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS OF BIOLOGICAL TISSUE USING A SINGLE COMPARATOR STANDARD AND DATA PROCESSING BY COMPUTER,
Massachusetts General Hospital, Boston. Physics Research Lab.
D. M. Linekin.
International Journal of Applied Radiation and Isotopes, Vol 24, No 6, p 343-351, June 1973. 4 fig, 2 tab, 7 ref.

Descriptors: *Neutron activation analysis, *Heavy metals, *Irradiation, Bromine, Sodium, Mercury, Iron, Chromium, Zinc, Cobalt, Pollutant identification.
Identifiers: *Biological samples, *Sample preparation, Scintillation counting, Gold, Selenium, Antimony, Silver, Scandium, Blood, Lung, Liver, Heart, Kidney, Tumors, *Multielement analysis.

Equations were derived which show that multielement analysis can be carried out with a single comparator standard, cobalt, and thereby eliminate multiple runs. A computer technique employing a Fourier transform is employed for data smoothing. Biological samples, human blood, lung, liver, heart, kidney, and mouse tumors were analyzed for Au, Br, Na, Se, Cr, Cs, Ag, Pb, Sn, Zn, Hg, Sb, Sc, Co, and Fe. The samples were prepared by lyophilizing in polyethylene vials, sealing, wrapping the vials with cobalt-aluminum wire, and irradiating at 2 times 10 to the 13th power thermal neutrons/sq cm/sec for 9 hours. Five or six days after irradiation, samples were transferred to counting vials and counted for 100 min in a reproducible geometry 30 cm from a Ge(Li) detector. Concentrations of Au, Br, and Na were determined from these results. The remaining elements were analyzed by making counts for 1000 min. at 5 cm from the detector six weeks after irradiation. Two weeks after irradiation, the cobalt wires were cleansed, weighed, and counted in the integral mode in a NaI well counter. The method should be useful for other kinds of samples. (Little-Battelle)
W74-06022

POLLUTION OF THE NORTH SEA,
Deutsches Hydrographisches Institut, Hamburg (West Germany).
For primary bibliographic entry see Field 5B.
W74-06023

DETERMINATION OF AMETRINE AND ATRAZINE RESIDUES IN SOIL BY THIN-LAYER CHROMATOGRAPHY,
Serbian Inst. of Public Health, Belgrade (Yugoslavia). Dept. of Sanitary Chemistry.
M. Huss, and V. M. Adamovic.
Journal of Chromatography, Vol 80, No 1, p 137-139, May 30, 1973. 1 tab, 9 ref.

Descriptors: *Separation techniques, Soil analysis, *Chromatography.
Identifiers: *Sample preparation, Thin layer chromatography, *Atrazine, *Ametrine, Detection limits, Recovery, Cleanup.

During a study of the degradation of atrazine and ametrine in soil a procedure for thin layer chromatography was developed. Soil samples were extracted by drying, grinding, shaking with ammonia solution and diethyl ether, filtering through sodium sulfate, evaporating, reconstituting with diethyl ether, evaporating to dryness, and dissolving the residue in chloroform. The dissolved residue was spotted on chromatoplate covered with alumina G to which Uramin A fluorescent color had been added. Near this spot, standard solutions of the pesticides were added, a carbon disulfide-ethyl acetate mixture was applied for separation, and the spots observed and marked under UV lights. These layers were scraped off and eluted with methanol in chloroform into tubes and evaporated. Determinations were made by rinsing the tubes with chloroform, partially evaporating, transferring the remainder to a silica gel chromatoplate, and developing the plate with carbon disulfide-ethyl acetate. The areas of the spots of the unknown compounds were compared with those of standards under UV light at 254 nm. Recovery of ametrine and atrazine was 80-83 percent and 100 percent, respectively. The procedure makes possible the detection of as little as 0.005 ppm triazine. Organochlorines do not interfere in the detection of triazines. (Little-Battelle)
W74-06024

DETECTION OF ORGANOPHOSPHOROUS PESTICIDES BY IN SITU FLUOROMETRY ON THIN-LAYER CHROMATOGRAMS,
Moncton Univ. (New-Brunswick). Dept. of Chemistry.
G. L. Brun, and V. Mallet.
Journal of Chromatography, Vol 80, No 1, p 117-123, May 30, 1973. 4 tab, 5 ref.

Descriptors: *Flurometry, *Organophosphorus pesticides, Fluorescence, *Chromatography, *Pollutant identification.
Identifiers: *Detection limits, Thin layer chromatography, Sample preparation, Azinphosmethyl, Bayrusil, Coumaphos, Cythioate, Dursban, Fospirate, Imidan, Maretin, Menazon, Noltran, Phosalone, Zinophos.

Solutions of 35 pesticides were prepared to study the effect of heat treatment alone or spraying the plate with an acid or base prior to heating on fluorescence during thin-layer chromatography. For chromatographic separation, the pesticides were spotted 2 cm from the bottom of the plate, eluted with m-hexane-acetone, dried, and when necessary sprayed with appropriate reagent. Plates were then heated at 50 to 250C for 10 to 120 minutes to establish optimum conditions for fluorescence. Twelve pesticides, azinphosmethyl, Bayrusil, coumaphos, cythioate, Dursban, Fospirate, Imidan, Maretin, menazon, Noltran, phosalone, and zinophos, gave positive results under various experimental conditions, and spectral data, experimental conditions, and detection limits (0.001-1.0 micrograms) are listed. The use of acid or base improved the limits of detection markedly in the case of Bayrusil, but in other cases there was either little improvement or a slight decrease in fluorescence. The importance of the acid- or base-treatment, however, was reflected more by the changes in the fluorescence excitation and emission maxima. In combining the spectral data on both techniques, a great deal more selectivity should be introduced in practice. Another advantage is that the use of acid or base does not have any effect whatsoever on the background of the plate. (Little-Battelle)
W74-06025

LIPOPOLYSACCHARIDE AND PROTEINS OF THE CELL ENVELOPE OF VIBRIO MARINUS, A MARINE BACTERIUM,
Georgetown Univ., Washington, D.C. Dept. of Biology.
C. F. Deneke, and R. R. Colwell.
Canadian Journal of Microbiology, Vol 19, No 10, p 1211-1217, October 1973. 5 fig, 2 tab, 33 ref.

Descriptors: *Proteins, *Cytological studies, Lipids, Phosphates, Acids, *Electrophoresis, *Marine bacteria, Centrifugation, Distillation, Hydrolysis, *Chromatography, Ureas, Pollutant identification, *Enteric bacteria.
Identifiers: *Vibrio marinus, *Lipopolysaccharides, Sugars, Fatty acids, Thin layer chromatography, Gas liquid chromatography, Flame ionization gas chromatography, Glucose, Heptose, Gel electrophoresis.

Lipopolysaccharides isolated from the marine bacterium Vibrio marinus strain PS-207 were found to be similar to the lipopolysaccharides of R mutants of enteric organisms, with respect to extraction characteristics, percentage of lipid A (61 percent), and sugars of the polysaccharide side chain (glucose and heptose). A high ratio (2:1) of phosphate to amino sugar was found in the lipid A. Hydroxy fatty acids constituted only 14 percent of the total fatty acids of the lipid A fraction, whereas branched and straight-chain fatty acids were present in greater abundance. The major envelope proteins of V. marinus strain PS-207 fell into three molecular weight classes determined by SDS gel electrophoresis. Numerous protein species were observed in urea-acetic polyacrylamide gel electrophoresis preparations. (Mortland-Battelle)
W74-06028

ARSENIC AND ANTIMONY IN LAUNDRY AIDS BY INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS,
Food and Drug Administration, Washington, D.C. Div. of Chemistry and Physics.
J. T. Tanner, M. H. Friedman, and G. E. Holloway.
Analytica Chimica Acta, Vol 66, No 3, p 456-459, October 1973. 1 fig, 1 tab, 3 ref.

Descriptors: *Neutron activation analysis, *Chemical analysis, *Detergents, *Pollutant identification, Water pollution sources, Domestic wastes, Laundering, Heavy metals, X-ray fluorescence, Colorimetry.
Identifiers: *Arsenic, *Antimony, Instrumental neutron activation analysis.

Samples of laundry aids (3 enzyme presoaks, 1 detergent, 2 heavy-duty enzyme detergents and 1 heavy-duty detergent) and standards of As(III) oxide and metallic antimony were sealed in quartz and irradiated for 20 min and allowed to undergo radioactive decay for 3-5 days for determinations of As and Sb concentrations by neutron activation analysis. The analyses were made with a high-resolution Nuclear Diodes Ge(Li) detector and a Nuclear Data 4096 channel analyzer. The concentrations in the laundry aids tested ranged from 5 to 51 ppm of As and from 1 to 8 ppm of Sb. In comparison, values for arsenic as determined by X-ray fluorescence and colorimetry were, respectively, 6-47 ppm and 5.57 ppm. (Holoman-Battelle)
W74-06030

THIN-LAYER CHROMATOGRAPHIC ANALYSIS OF HMX IN WATER,
Naval Ordnance Lab., White Oak, Md.
D. J. Glover, and J. C. Hoffsommer.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 5, p 302-304, November 1973. 1 tab, 1 ref.

Descriptors: *Pollutant identification, Water analysis, Aqueous solutions, Water pollution, Chemical analysis, Solubility, Methodology, *Solvent

extractions. Separation techniques. Explosives. Waste water Pollution. *Chromatography.
Identifiers. *Thin layer chromatography, *HMX, Trace levels, Detection limits, 1,3,5,7-Tetranitro-1,3,5,7-tetrazacyclooctane, *Explosive wastes.

HMX (1,3,5,7,-tetranitro-1,3,5,7-tetrazacyclooctane) may be determined in concentrations down to 0.05 ppm in water by a combination of extraction, concentration, and thin-layer chromatography. The solubility of HMX in water was determined to be 5.0 ppm at 22 degrees plus over minus 2C. (Holoman-Battelle)
W74-06033

EFFECT OF WATER HARDNESS ON THE TOLERANCE OF THE GUPPY TO BERYLLIUM SULFATE.
Johns Hopkins Univ., Baltimore, Md.
For primary bibliographic entry see Field 5C
W74-06034

A DEVICE FOR MEASURING THE AVERAGE TEMPERATURE OF WATER, SOIL, OR AIR.
Forest Service (USDA), Grand Rapids, Minn. Northern Conifers Lab.
J. M. Brown.
Ecology, Vol 54, No 6, p 1397-1399, Autumn 1973. 2 fig, 1 tab, 3 ref.

Descriptors: *Water temperature, *Measurement, Air, Soils, Electronic equipment, Design criteria, Instrumentation, *Soil temperature, *Air temperature, Temperature.
Identifiers: *Electronic integrating thermometer.

It is possible to directly measure average temperature with a simple electronic circuit and avoid the usual time-consuming arithmetic integration of temperature records. Instructions are given for the construction of an electronic integrating thermometer composed of a thermistor in a simple Wheatstone bridge and a mercury switch that provides a direct readout of the average temperature of soil, air, or water over a designated time interval. (Little-Battelle)
W74-06045

TRACE METALS IN CARBONATE AND ORGANIC RICH SEDIMENTS.
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
D. A. Segar, and R. E. Pellenbarg.
Marine Pollution Bulletin, Vol 4, No 9, p 138-142, September 1973. 6 fig, 1 tab, 14 ref.

Descriptors: *Bottom sediments, *Heavy metals, *Pollutant identification, Chemical analysis, *Trace elements, Carbonates, Estuarine environment, Organic soils, Clays, Water pollution sources, Deep water, Nickel, *Florida, Surface waters, Calcium, Iron, Cadmium, Lead, Zinc, Copper, Brackish water, Ecological distribution, Soil analysis, *Spectrophotometry.
Identifiers: Marine environment, Card Sound(Fla), Biscayne Bay(Fla), Silver, *Bermuda Mangrove Lake, Vanadium, Sample preparation, Flameless atomic absorption spectrophotometry.

During an investigation of the trace transition metal distributions within carbonate and organic rich near-shore and estuarine sediments, three separate geographical locations, Card Sound and Turkey Point, Florida and Mangrove Lake, Bermuda, have been studied. The sediment samples were collected with hand coring tubes and homogenized. A subsample was freeze-dried to a constant weight and analyzed by flameless atom reservoir atomic absorption spectrophotometry after acid dissolution and solvent extraction of the metal pyrrolidine dithiocarbamates. The results obtained from the three areas show that the accumulations could be ascribed to local human activities, though their nature varied widely from one site or another. (Holoman-Battelle)
W74-06050

PESTICIDE RESIDUES IN NATURAL FISH POPULATIONS OF THE SMOKY HILL RIVER OF WESTERN KANSAS - 1967-69: 10H. E. KLAASSEN, AND
Kansas State Univ., Manhattan. Div. of Biology.
H. E. Klaassen and A. M. Kadoum.
Pesticides Monitoring Journal, Vol 7, No 1, p 59-64, June 1973. 2 fig, 4 tab, 14 ref.

Descriptors: *Fish populations, *Pesticide residues, *Chlorinated hydrocarbon pesticides, *Freshwater fish, Dieldrin, DDT, Baseline studies, Chemical analysis, Channel catfish, Carp, Killifishes, Electro-fishing, Sampling, Endrin, Aldrin, Heptachlor, White bass, *Kansas.
Identifiers: *Smoky Hill River(Kan), Metabolites, Background levels, Animal tissues, Sample preservation, Sample preparation, Electron capture gas chromatography, Heptachlor epoxide, River carpsucker, Shorthead, Red shiner, Plains killifish, Green sunfish, Gizzard, Heptachlor epoxide, o,p' DDT, p,p' DDT, p,p' DDE, p,p' DDD, Muscle, Testes, Ovaries, Bluegills, Gizzard shad, Plains minnow, Sand shiner, Suckermouth minnow, Bluntnose minnow, Flathead minnow, Creek chub, Black bullhead, Yellow bullhead, Stonecat.

Fish Population from five locations in an area of low pesticide use are described and their pesticide residue levels are given for the 3-year period 1967-69. The study was carried out in a dry-land farming area with developing irrigation on the Smoky Hill River of west central Kansas. Fish samples were collected by electro-shocking at five stations along an 80-km section of the river. A total of 398 samples of the commonly occurring species whole body, flesh, gonads) were analyzed for organochlorine residues by electron capture gas chromatography. During the 3 years, 24 species of fishes were collected. 15 of these species were common to the study area. The number of species, number of individuals collected, and species diversity are presented for each station with respect to time. No endrin, aldrin, or heptachlor residues were detected in any sample. Heptachlor epoxide was found in trace amounts in three samples. Dieldrin was present in 15 percent of the samples, usually in amounts less than 0.01 ppm. DDT and its metabolites were detected in 75 percent of the samples, usually at only several hundredths of a part per million. The fish populations collected were considered "clean" from pesticides when compared with fishes from other surveys. These data form a baseline for future comparison as the agriculture changes in this area. (Holoman-Battelle)
W74-06051

INTERNATIONAL COOPERATIVE STUDY OF ORGANOCHLORINE AND MERCURY RESIDUES IN WILDLIFE, 1969-71.
Freshwater Fisheries Lab., Pitlochry (Scotland).
A. V. Holden.
Pesticides Monitoring Journal, Vol 7, No 1, p 37-52, June 1973. 16 tab, 3 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Mercury, *Heavy metals, *Polychlorinated biphenyls, *Wildlife, Shellfish, Freshwater fish, Waterbirds, Pollutants, Pollutant identification, Bird eggs, Insecticides, Chemical analysis.
Identifiers: Bioaccumulation, Animal tissues, Interlaboratory studies, Collaborative studies, Chlorinated hydrocarbons, Northern pike, Eggs, Lucius, Methylmercury, Methylmercury dicyandiamide, Precision, Muscle, Lindane, Heptachlor epoxide, p,p' DDE, p,p' TDE, p,p' DDT, o,p' DDT, Clophen A50, Roach, Cormorant, DCBP, Aroclor 1260, Clophen A50, Phenoclor DP6, Aroclor 1254, Rutilus rutilus, Anguilla vulgaris, Mytilus edulis, Clupea harengu, Clupea Sprattus, Sprat, Ardea, Pelecanus, Podiceps, Uria, Alca, Sterna.

A two-part collaborative study of organochlorine pesticides, polychlorinated biphenyls (PCB's), and mercury residues was carried out by 26 laboratories in 12 countries. The first part involved the analysis of three test samples containing organochlorine residues and one group of test samples containing mercury. One organochlorine sample contained seven pesticides or derivatives added to corn oil; a second was a standard solution of a PCB formulation in toluene; and the third a homogenate of cormorant (Phalacrocorax carbo) muscle containing mainly PCB's. With few exceptions, agreement among the analysts involved was reasonably good and acceptable for monitoring wildlife residues. Coefficients of variation for the various organochlorines were from plus or minus 10 percent to plus or minus 7 percent. The test samples containing mercury included a group of freeze-dried homogenates of the muscle tissue of pike, liver tissue, and an ampoule of methylmercury dicyandiamide in water. The samples were analyzed for total and methylmercury. Again, agreement was reasonably good, although only four laboratories reported total mercury values and eight, methylmercury values. The second part of the program required the sampling and analysis of several species of wildlife from both terrestrial and aquatic environments, including fish, shellfish, and the eggs of birds. Samples were taken in specified numbers and at specified times, from both areas considered to be free of any pesticide usage and areas known or believed to be seriously polluted. Eggshell thickness indices were also determined. The results of the wildlife analyses demonstrated the difficulties in selecting species appropriate for international monitoring programs, in identifying (before analysis) areas of slight contamination, and in relating concentrations to measurable biological effects. Samples of any one species from areas regarded as unpolluted in different countries contained a wide range of organochlorine concentrations. The PCB levels in mussels from such areas contained 0.01 to 0.67 mg/kg, and DDE levels in herring ranged from less than 0.01 to 0.05 mg/kg. The differences between results for samples in this second part of the study were much greater than the analytical variations estimated from the first part of the study. (Holoman-Battelle)
W74-06055

INABILITY TO DETECT SPORES OF CLOSTRIDIUM BOTULINUM IN FISH PROTEIN CONCENTRATES (FPC).
Department of National Health and Welfare, Ottawa (Ontario). Food and Drug Research Lab.
A. H. W. Hauschild, H. Pivnick, and L. W. Regier.
Journal of the Fisheries Research Board of Canada, Vol 30, No 11, p 1760-1762, November 1973. 1 tab, 8 ref.

Descriptors: *Botulism, Proteins, Spores, Cultures, Lethal limit, Toxicity, Separation techniques, *Pollutant identification.
Identifiers: *Fish protein concentrate, *Clostridium botulinum, Mice, Sample preparation, *Detection limits.

Samples of fish protein concentrates from a total of 124 production lots prepared in pilot plants by three different methods have been tested for the presence of viable Clostridium botulinum spores by incubating them in cooked meat medium and assaying the culture supernatant fluids for toxin. The samples were divided into three groups. The 36 lots of group A were prepared by a hot isopropanol extraction method from skate, dogfish, cod frames and fillets, flounder, ocean perch, sand lance, swordfish, herring, capelin, and haddock frames. The 60 lots of group B were prepared from cod fillets by a more gentle procedure (unpublished, patent pending) which includes dispersion of the meat in water, centrifuging, resuspension of the sediment in dilute brine, pH adjustment to 8.5, holding, adjusting to pH 4.5, heating and cooling, adjusting to pH 6.5, centrifuging, three repeated lipid extractions of the sedi-

ment with isopropanol at ambient temperature, drying in a rotating cone vacuum drier at 70-75C, and grinding in a Hammer mill. The 24 lots of group C were prepared by hot isopropanol extraction of hake, menhaden, and anchovy. No spores of C. botulinum could be demonstrated with certainty in any of the 124 samples of FPC tested. Two of the supernatant fluids were lethal to mice, but their lethal effects appeared to be caused by factors other than C. botulinum toxin. (Mortland-Battelle)
W74-06058

A PORTABLE WIRE-SPEED INDICATOR FOR USE WITH PLANKTON NETS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
For primary bibliographic entry see Field 7B.
W74-06059

OCCURRENCE OF DDT RESIDUES IN BELUGA WHALES (DELPHINAPTERUS LEUCAS) FROM THE MACKENZIE DELTA, N.W.T.,
Bedford Inst., Dartmouth (Nova Scotia).
R. F. Addison, and P. F. Brodie.
Journal of the Fisheries Research Board of Canada, Vol 130, No 11, p 1733-1736, November 1973. 1 tab, 16 ref.

Descriptors: *Marine animals, *Pesticide residues, *Pollutant identification, *DDT, Chlorinated hydrocarbon pesticides, Mammals, Chemical analysis, Lipids, Pollutants, *Canada.
Identifiers: *Beluga whales, Animal tissues, Delphinaterus leucas, p p' DDE, p p' DDT, o p' DDT, Isomers, Blubber, Muscle, Liver, Gas liquid chromatography, Sample preparation, Shallow Bay, Kugmallit Bay, p p' DDD.

Tissue samples from 14 Beluga whales were analyzed for the presence of pesticide residues as a possible reflection of the level of pesticide contamination of the marine environment in the Mackenzie Delta area. Blubber, middorsal muscle, and liver samples were taken and preserved in formalin or frozen. Ten grams were dissected from the interior of each sample, extracted by homogenizing with an acetonitrile-based system, evaporated to dryness for gravimetric lipid determination. Additional aliquots were cleaned up by chromatography on Florisil and analyzed by gas-liquid chromatography. Only residues of the DDT group were detected with certainty. Muscle and liver contained p,p'-DDE and p,p'-DDT; total residue concentrations in these tissues were approximately 0.01 and 0.02 ppm fresh weight, respectively. Blubber contained p,p'-DDE, p,p'-DDT and o,p'DDT; total residue content was approximately 2-4 ppm fresh weight. (Holoman-Battelle)
W74-06061

PESTICIDES IN SELECTED WESTERN STREAMS - 1968-71,
Geological Survey, Austin, Tex. Water Resources Div.
J. A Schulze, D. B. Manigold, and F. L. Andrews.
Pesticides Monitoring Journal, Vol 7, No 1, p 73-84, June 1973. 3 fig, 3 tab, 9 ref.

Descriptors: Natural streams, *Chlorinated hydrocarbon pesticides, *Phosphothioate pesticides, *Monitoring, *Polychlorinated biphenyls, Pollutant identification, Insecticides, Herbicides, Water analysis, Gas chromatography, Water sampling, Solvent extractions, *Data collections, Diazinon, Organophosphorus pesticides, Heptachlor, DDT, 2 4 5-T, Missouri River, Rio Grande River, Colorado River, Columbia River, 2 4-D, Dieldrin, DDD, DDE, Endrin, Aldrin.
Identifiers: Sample preparation, Heptachlor epoxide, Parathion, Methyl parathion, Malathion, Lindane, Silvex, Endosulfan, Chlordane, Toxaphene, Electron capture gas chromatography, Flame photometric gas chromatography, Yellowstone River, James River, Platte River, Arkansas River, Canadian River, Brazos River, Pecos River, Green River, Gila River, Humboldt River, Sacramento River, Yakima River, Snake River, Feather River.

Data are presented from the U.S. Geological Survey program for monitoring pesticides in the streams of the Western United States for the period October 1968 to September 1971. Samples were collected in 1-quart glass bottles sealed with a Teflon-lined screw cap. Two bottles were collected at each of 20 sampling stations, one for insecticide analysis and the other for herbicide analysis. All analyses were performed by gas chromatography. Compounds determined include the common chlorinated insecticides and herbicides. Heptachlor and its epoxide were not detected during the 3-year period, and aldrin was found only once. DDT was the most frequently occurring insecticide, and 2,4,5-T the most common herbicide. The amounts observed were small; the maximum concentration of an insecticide was 0.46 microgram/liter for DDT, and of an herbicide 0.99 microgram/liter for 2,4-D. Concentrations were highest in water samples containing appreciable amounts of suspended sediments. Graphs are included to show insecticide and herbicide occurrences for the 4-year period (October 1967-September 1971) during which all 20 monitoring stations have been in operation. Beginning in July 1970, the phosphorothioate insecticides - parathion, methyl parathion, malathion, and diazinon - were determined monthly on all samples. Malathion was not found during this period. Polychlorinated biphenyl (PCB's) compounds which were monitored for beginning in October 1969 were also detected at two stations. (Holoman-Battelle)
W74-06062

ATTACHMENT OF BACTERIA TO SULPHUR IN EXTREME ENVIRONMENTS,
Indiana Univ., Bloomington. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W74-06065

TRACE METAL WATER POLLUTANTS DETERMINED BY X-RAY FLUORESCENCE,
Naval Research Lab., Washington, D.C.
P. G. Burkhalter.
Available from the National Technical Information Service as AD-766 453 $2.75 in paper copy $1.45 in microfiche. Report No. NRL-7637, August 7, 1973. 15 p, 7 fig, 6 tab, 12 ref, append.

Descriptors: *X-ray fluorescence, *Sewage sludge, *Trace elements, *Water analysis, *Pollutant identification, Manganese, Iron, Zinc, Lead, Copper, Cadmium, Potassium, Titanium, Strontium, Heavy metals, Cation exchange, Ions, Sewage effluents, Filters, Separation techniques, Alkaline earth metals.
Identifiers: Arsenic, Selenium, Zirconium, Sample preparation.

X-ray fluorescence analysis was evaluated for determining trace metals in samples of Potomac River water and Blue Plains sewage sludge. A specimen of Potomac River water was filtered through 0.8-micron Millipore filters to collect the particulates. The water, now clear, was acidified with HCl to a pH of about 2, and was passed seven times through a Reeve Angel SA-2 cation exchange paper to collect the dissolved ions. The ions from an EPA multi-element solution with known amounts of the elements were collected on ion-exchange paper in a similar fashion for comparison. Samples of sewage sludge were filtered onto the millipore paper without difficulty. X-ray spectra were collected for 100 seconds for each of the samples. XRF analysis was found useful for multi-element determinations of trace metals in polluted waters. Both particulates and soluble trace metals in river water and sewage sludge can easily be sampled on filter papers which are convenient for use in x-ray equipment. The detectable limits for many pollutants with atomic numbers ranging from Ca to Pb are in the 1-10 ppb range for particulates filtered from river water and in the 5-15 ppb range for soluble trace metals extracted by ion-exchange papers. However more work is necessary to study the use of ion exchange papers and interferences in actual multi-element samples and to establish the best conditions for XRF of water pollution samples. (Mortland-Battelle)
W74-06079

SOLVENT EXTRACTION OF COPPER (II) AND ZINC (II) WITH 1,5-DIPHENYLCARBAZONE,
National Inst. for Researches in Inorganic Materials, Ibaraki (Japan).
H. Einaga, and H. Ishii.
Analyst, Vol 98, No 1172, p 802-810, November 1973. 5 fig, 2 tab, 10 ref.

Descriptors: *Copper, *Zinc, *Solvent extractions, *Ions, Separation techniques, Aqueous solutions, Spectrophotometry, Absorption, Hydrogen ion concentration, Mathematical studies, Water analysis, *Heavy metals, Pollutant identification.
Identifiers: 1 5-Diphenylcarbazone, Isobutyl methyl ketone, Ligands, Molar absorptivity, Organic solvents.

The extraction characteristics of 1, 5-diphenylcarbazone and its complexes with the bivalent metal ions copper(II) and zinc(II) in an isobutyl methyl ketone-water system have been studied and the extraction curves of these metal complexes have also been obtained. The copper(II) complex is extracted from a more acidic solution than is the zinc(II) complex. A mixture of N ml of the 1, 5-diphenylcarbazone solution and (20.0-n) ml of isobutyl methyl ketone was equilibrated at various pH values with 20.0 ml of an aqueous solution that contained a definite amount of metal ions and was adjusted to an ionic strength of 0.10 M with ammonium chloride. After separation of the phases, the metal ions extracted into the organic phase were determined by measuring absorbances at a specified wavelength and by making use of the molar absorptivity of each metal ion. The separation aqueous phase was used for measurement of hydrogen-ion concentration. The concentration of metal ions in the aqueous phase was obtained as the difference between the initial concentration and that in the organic phase, and the ratio of the concentration of the metal ions in the organic phase to that in the aqueous phase was calculated from these results. The extraction equilibria were examined and the extraction constants determined. The spectral properties of the complexes were also determined and the application of the reagent to the determination of copper and zinc is suggested. (Mortland-Battelle)
W74-06088

A SOLVENT-SAVING EXTRACTION-EVAPORATION APPARATUS DEVELOPED FOR RESIDUE ANALYSIS OF PESTICIDES,
CIBA-GEIGY Ltd., Basel (Switzerland).
G. Voss, and W. Blass.
Analyst, Vol 98, No 1172, p 811-812, November 1973. 1 fig, 1 tab, 1 ref.

Descriptors: *Pesticide residues, *Separation techniques, DDT, Gas chromatography, Laboratory equipment, Solvents, Soil analysis, *Solvent extractions, *Pollutant identification.
Identifiers: *Soxhlet extraction, Atrazine, Chlorobenzilate, Dichlorvos, Methidathion, Cleanup, Monocrotophos, Gas liquid chromatography, Column chromatography, Thin layer chromatography, Preconcentration, Biological samples, Chemical Recovery.

An apparatus that simultaneously allows Soxhlet extraction of pesticedes and concentration of the resulting extract has been designed. The evaporated solvent is refluxed into the Soxhlet

flask where it is utilized again for the extraction. The major advantages of this cyclic extraction-evaporation system are that redistillation of solvents prior to extraction can be omitted, that manual work is reduced, as the solvent evaporation process occurs simultaneously with the extraction of the sample, and that excess of solvent is not wasted but re-utilized for extraction, which is of interest from the economic and environmental contamination points of view. The procedure was tested with loam spiked with atrazine, apples spiked with chlorobenzilate, meat spiked with DDT, wheat spiked with dichlorvos, orange peel spiked with methidathion, and cotton seeds spiked with monocrotophos. Recoveries ranged from 74-110 percent. (Mortland-Battelle)
W74-06089

COLIFORM COUNTS OF POLLUTED WATERS: A COMPARISON OF MEDIA AND METHODS,
Nairobi Univ. (Kenya). Dept. of Civil Engineering.
D. D. Mara.
Water Research, Vol 7, No 12, p 1899-1903, December 1973. 1 fig, 3 tab, 8 ref.

Descriptors: *Pollutant identification, *Isolation, *Coliforms, *Methodology, E. coli, Sewage, Membrane processes, Fermentation, Cultures.
Identifiers: *Enumeration, *Culture media, Membrane filters, Enterobacter aerogenes, Culturing techniques, Kenya, Most probable number test.

Samples of sewage and polluted river water were used to compare various media for the enumeration of coliform organisms, including Escherichia coli, by the membrane filtration, pour-plate and MPN techniques. The counts were done using the standard procedures for each technique. Incubation times and temperatures for the MPN and membrane filtration media were those recommended (Report, 1969; A.P.H.A., 1971); those for the pour-plate media were 4 h at 30 C (or, in the case of chlorinated samples, 6 h at 25 C) followed by 18-20 h at either 35 or 44 C. Millipore membrane filters were used. In the pour-plate experiments surface growth was prevented by pouring a thin overlay of medium as soon as the original medium had set; after incubation only colonies larger than 2 mm were counted. The results indicated that the pour-plate technique with LTA (lactose teepol agar) is a reliable alternative to membrane filtration and the MPN technique. It is, of course, suitable only for coliform densities greater than 3000/100 ml, but for such densities it is the method of choice since it is more economic, both in terms of time and materials than the other two methods. It is, however, less convenient to use than the agar dip-slide method which gives counts to the nearest order of magnitude in the range 10,000-1 billion cells/100 ml. (Mortland-Battelle)
W74-06093

A SIMPLIFIED FLOW-SPLITTING CHAMBER AND SIPHON FOR PROPORTIONAL DILUTERS,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 7B.
W74-06094

GLASS ELECTRODE RESPONSES INTERPRETED BY THE SOLID STATE HOMOGENEOUS- AND HETEROGENEOUS-SITE MEMBRANE POTENTIAL THEORY,
North Carolina Univ., Chapel Hill. William R. Kenan, Jr. Lab. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-06095

MYCOLOGICAL APPLICATIONS OF X-RAY MICROANALYSIS,
U.E.R. Cordeliers, Paris (France). Laboratoire de Parasitologie et Mycologie.
M. Thibaut, and M. Ansel.
Journal of Bacteriology, Vol 116, No 3, p 1181-1184, December 1973. 4 fig, 7 ref.

Descriptors: *Fungi, *Chemical analysis, *X-ray analysis, *Spectroscopy, Plant tissues, Calcium, Potassium, Sulfur, Phosphorus, Magnesium, Chlorides, Sodium, Alkali metals, Alkaline earth metals.
Identifiers: Chemical composition, *Microanalysis, Wavelength dispersive spectroscopy, Ascomycetes, *Aspergillus fumigatus, Aspergillus niger.

In Aspergillus fumigatus, X-ray microanalysis applied in wavelength dispersive spectroscopy enabled the detection of the presence of Ca, K, S, P, and Mg. In A. niger the presence of Ca, K, chloride, S, P, Na, and Mg was detected. These various elements were identified by their K sub alpha lines. (Holoman-Battelle)
W74-06096

OCCURRENCE OF PHOSPHONOSPHINGOLIPIDS IN BDELLOVIBRIO BACTERIOVORUS STRAIN UKI2,
Kentucky Univ., Lexington. School of Biological Sciences.
S. Steiner, S. F. Conti, and R. L. Lester.
Journal of Bacteriology, Vol 116, No 3, p 1199-1211, December 1973. 6 fig, 10 tab, 31 ref.

Descriptors: *Chemical analysis, Separation techniques, Radioactivity techniques, Methodology, *Pollutant identification, Lipids, Organic acids, *Chromatography.
Identifiers: Chemical composition, *Phospholipids, *Bdellovibrio bacteriovorus, Characterization, Phosphonosphingolipids, Sample preparation, Biosynthesis, Heterotrophic bacteria, Phosphatidylethanolamine, Phosphatidylglycerol, Flame ionization gas chromatography, Paper chromatography, Autoradiography, Column chromatography, Thin layer chromatography, Phosphatidic acid, Phosphatidylserine, Cardiolipin, Fatty acids.

The major phospholipids of two strains of Bdellovibrio bacteriovorus were characterized. Both strain UKil, which is obligately saprophytic, and strain UKi2 which is facultatively parasitic, contained phosphatidylethanolamine and phosphatidylglycerol as their major glycerophosphatides. A branched, 15-carbon fatty acid is the major component of these alkali-labile lipids. Absent from UKi1 but present in UKi2 were three alkali-stable lipids (compounds 8,9, and 11) which appear to be phosphosphingolipids. After acid hydrolysis, both compound 8 and 9 yield the identical phosphorus-containing substance that is water soluble, dipolar ionic, and ninhydrin positive. The substance appears to contain a C-P bond since P sub 1 could not be released from this substance by treatment with alkaline phosphatase or by very harsh mineral acid treatment. Based on chromatographic comparisons, this phosphonate appears to be a novel lipid constituent. Upon degradation, compound 8 yields 1 mol of dihydroxy long-chain base and compound 9 yields 1 mol of a trihydroxy long-chain base. These bases appear to have a 17-carbon, possibly branched, structure based on gas-liquid chromatography retention times. Degradation of both sphingolipids yields a mixture of hydroxy fatty acids, the major component being a branched, 15-carbon hydroxy acid. (Holoman-Battelle)
W74-06097

DEFECTS IN PRODIGIOSIN FORMATION BY L-FORMS OF SERRATIA MARCESCENS,
Veterans Administration Hospital-Wadsworth, Los Angeles, Calif. Research and Medical Service.
C. S. Potter, E. G. Hubert, J. Z. Montgomerie, G. M. Kalmanson, and L. B. Guze.
Journal of Bacteriology, Vol 116, No 3, p 1343-1345, December 1973. 2 tab, 6 ref.

Descriptors: *Pigments, *Separation techniques, *Aerobic bacteria, Cultures, Methodology, Chemical analysis, Assay.
Identifiers: *Mutants, *Serratia marcescens, *Prodigiosin, Heterotrophic bacteria, Culture media, 4-Methoxy-2 2'-bipyrrole-5-carboxaldehyde, 2-Methyl-3-n-amylpyrrole.

An L-form of Serratia marcescens has previously been shown incapable of producing the red pigment, prodigiosin, characteristic of the parent bacteria. Mutants of S. marcesens, unable to form one or the other of the two prodigiosin precursors, 4-methoxy-2,2'-bipyrrole-5-carboxaldehyde or 2-methyl-3-n-amylpyrrole, were used to test the nature of the L-form defect. The L-forms failed to form sufficient amounts of either precursor to be detected by the appropriate mutant, and, when furnished the precursors, failed to couple them to form prodigiosin. (Holoman-Battelle)
W74-06099

CRITERIA FOR ESTIMATING LIMITING NUTRIENTS IN NATURAL STREAMS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W74-06105

ELECTRON DONOR-ACCEPTOR REAGENTS IN THE ANALYSIS OF PESTICIDES. VII. A SIMPLE MODEL SYSTEM HYDROLYSIS OF SOME CARBAMATE PESTICIDES,
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
For primary bibliographic entry see Field 5B.
W74-06121

STUDIES WITH DITHIZONE. PART XXX. COMPLEXES OF METALS, WITH S-METHYLDITHIZONE AND THE METHYLATION OF METAL DITHIZONATES,
Leeds Univ. (England). Dept. of Inorganic and Structural Chemistry.
H. M. N. H. Irving, A. H. Nabilsi, and S. S. Sahota.
Analytica Chimica Acta, Vol 67, No 1, p 135-144, November 1973. 3 fig, 1 tab, 14 ref.

Descriptors: *Chlorides, *Ions, *Nitrates, *Heavy metals, Copper, Mercury, Nickel, Cobalt, Manganese, Zinc, Sulfur, Absorption, Chemical reactions, Chelation.
Identifiers: *Methyldithizone, *Methylation, *Acetates, *Metal chelates, Palladium, Phenylmercury, Dithizone, Methyl iodide, Nickel dithizonate, Sodium acetate, Palladium dithizonate, Bipyridyl, Chemical interference, Rare earth elements.

S-Methylidithizone (5-methylmercapto-1,5-diphenylformazan) reacts with the chlorides of copper(II), mercury(II) and phenylmercury(II) to give the 1:1 chelates (CuCl(MeDx), HgCl(MeDz) and C6H5Hg(MeDz)) and with nickel(II) and palladium(II) to give the 1:2 chelates, M(MeDz)2. All these complexes are intensely coloured in chloroform solution. No complexes are formed from cobalt(II), manganese(II) or zinc(II) or from the nitrates or acetates of copper and mercuy. Coordination increases the reactivity of the sulphur atom in dithizone. Whereas dithizone is unaffected by methyl iodide, nickel dithizonate, Ni(HDz)2, gives Ni(MeDz)2 when heated with methyl iodide in ethanol in the presence of sodium acetate; palladium dithizonate behaves similarly. The 1:1 adduct of nickel dithizonate with 2,2'-bipyrdyl gave only Ni(MeDz)2 on treatment with methyl iodide, and this complex would not form an adduct with bipyridyl. On standing in the light, Ni(MeDz)2 reacted photochemically to give the yellow isomer of S-methyl-dithizone. (Mortland-Battelle)
W74-06122

DISTRIBUTION OF DIELDRIN IN THE TURTLE,
Louisiana State Univ., New Orleans. Dept. of Pharmacology.
J. E. Pearson, K. Tinsley, and T. Hernandez.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 6, p 360-364, December 1973. 1 fig, 1 tab, 12 ref.

Descriptors: *Dieldrin, *Turtles, *Absorption, *Chemical analysis, *Pollutant identification, Gas chromatography, Separation techniques.
Identifiers: Animal tissues, *Bioaccumulation, Biological samples, Blood, Muscle, Brain, Kidneys, Liver, Electron capture gas chromatography, Adipose tissue, Sample preparation, Sample preservation.

A number of turles weighing 300 grams to one kilogram were injected with 20 mg/kg of dieldrin in a one-to-one solution of diethyl ether and corn oil (50 mg/kg). Groups were sacrificed at intervals for tissue analysis. At timed intervals after the intraperitoneal injection of dieldrin (20 mg/kg), the turtles were placed on a turtle board and with a hack-saw the ventral carapace was sawed off. The soft tissues were carefully dissected from the carapace to minimize bleeding. A blood sample was obtained from the heart and was kept chilled until centrifuged to separate the plasma. Sections of liver, kidney, muscle, and brain were obtained and quick frozen until analyzed. A sample of brown fat was dissected from the subcutaneous area of the perineal region. The concentration of dieldrin in the plasma and tissues was estimated by gas chromatography. The rate of absorption of dieldrin in the turtle after intraperitoneal injection was slow and unpredictable. The results at any single time were variable due to the erratic absorption from the intraperitoneal site. The fat depots gradually increased until the concentration of dieldrin approached 1000 ppm or 0.1 percent of the weight of the fat. Next to the fat, the liver has the greatest propensity to concentrate dieldrin. (Mortland-Battelle)
W74-06124

PHOTODECOMPOSITION OF CHLORINATED BIPHENYLS AND DIBENZOFURANS,
California Univ., Davis. Dept. of Environmental Toxicology.
For primary bibliographic entry see Field 5B.
W74-06125

HERBICIDE ANALYSIS BY PULSE POLAROGRAPHY-FICLORAM,
Northern Arizona Univ., Flagstaff. Dept. of Chemistry.
D. D. Gilber, and J. M. Mann.
International Journal of Environmental Analytical Chemistry, Vol 2, No 3, p 221- 228, February 1973. 3 fig, 2 tab, 19 ref.

Descriptors: *Chemical analysis, *Herbicides, *Chlorinated hydrocarbon pesticides, Heavy metals, Aqueous solutions, Cations, Electrochemistry, Pollutant identification, *Polarographic analysis, Hydrogen ion concentration, Temperature, Water analysis, Methodology.
Identifiers: Pulse polarography, *Picloram, Ionic interference, Precision, Natural waters, Ionic strength, Detection limits, Buffers, Sensitivity.

The herbicide picloram, 4-amino-3,5,6-trichloropicolinic acid, can be determined at 0.02 ppm, without concentration, by pulse polarography. The effects of pH, ionic strength, and buffer constituents on the catalytic hydrogen process have been studied to optimize conditions for highest sensitivity for picloram. A buffer solution 0.01 M sodium acetate - 0.026 M acetic acid was used to evaluate the analysis of a natural water system. Errors range from 3-8 percent (relative) in the 0.05-0.20 ppm picloram range with precisions of plus or minus 5 percent (relative) or better. Interferences with 0.1 ppm picloram from 100 ppm Cr(VI) and Zn(II) are severe; neither ion interferes at 1 ppm. Fe(III) interferences can be eliminated by masking with EDTA. Mn(II), Cu(II), and Pb(II) do not interfere at 10 ppm. The results describe a method which is 4-5 times more sensitive than other reported polarographic methods and is more rapid than the conventional bioassay or gas chromatographic techniques. In addition, the pulse method is about 10 times more sensitive than the colorimetric analysis and can be conducted in a normally lighted laboratory. (Holoman-Battelle)
W74-06127

DETERMINATION OF RESIDUES OF MESUROL AND ITS TOXIC METABOLITES IN PLANT AND ANIMAL TISSUES,
Baychem Corp., Kansas City, Mo. Chemagro Div.
J. S. Thornton, and G. Drager.
International Journal of Environmental Analytical Chemistry, Vol 2, No 3, p 229-239, February 1973. 2 fig, 1 tab, 19 ref.

Descriptors: *Pesticide residues, *Plant tissues, *Chemical analysis, *Thiocarbamate pesticides, Pollutant identification, Cattle, Methodology, Crops, Solvent extractions, Apples, Corn(Field), Sugar beets, Fruit crops, *Gas chromatography.
Identifiers: *Mesurol, *Metabolites, Animal tissues, Flame photometric gas chromatography, Chemical recovery, Sample preparation, Mesurol sulfoxide, Mesurol sulfone, Pears, Brain, Adipose tissue, Heart, Kidneys, Liver, Muscle.

A specific gas chromatographic procedure is described for the determination of residues of Mesurol (4-(methylthio)-3,5-xylyl methylcarbamate) and its sulfoxide and sulfone metabolites in plant and animal tissues. After initial extraction and precipitation cleanup steps, the extract is oxidized with potassium permanganate to convert Mesurol and its sulfoxide to the sulfone. Final detection of the sulfone is by the sulfur-specific flame photometric detector, thereby allowing little interference from tissue co-extractives. Recovery data from experiments run on a large variety of crops and tissues by adding known amounts of Mesurol and metabolites at the blending step were generally in the 70 to 120 percent range. The method is sensitive to the 0.03-ppm level. (Holoman-Battelle)
W74-06128

DETERMINATION OF PHTHALATES IN BIOLOGICAL SAMPLES,
Fisheries Research Board of Canada, St. Andrews (New Brunswick).
V. Zitko.
International Journal of Environmental Analytical Chemistry, Vol 2, No 3, p 241-252, February 1973. 3 fig, 7 tab, 21 ref.

Descriptors: *Chemical analysis, Methodology, *Separation techniques, Bird eggs, Juvenile fish, Lipids, Fluorescence, Pollutant identification, Water birds, Atlantic salmon, Solvent extractions, *Sampling.
Identifiers: Cleanup, *Phthalates, *Biological samples, Animal tissues, Environmental samples, Fish oil, Blubber, Corn oil, Dibutyl phthalate, *Plasticizers, Di-2-ethylhexyl phthalate, Seals(Animals), Salmo salar, Phoca vitulina, Phalacrocorax auritus, Larus argentatus, Flame ionization gas chromatography, Alumina chromatography, Thin layer chromatography, Dioctyl phthalate, Column chromatography, Diamyl phthalate, Diisodecyl phthalate, Diethyl phthalate, Dimethyl phthalate, Dimethyl terephthalate.

A cleanup of biological samples is described for the determination of phthalates. It can be incorporated into a cleanup-chromatography procedure used for the determination of chlorinated hydrocarbons. Phthalates, extracted from biological samples with hexane, are partially separated from lipids by chromatography on alumina to yield fractions in which the common phthalate plasticizers can be quantitated by gas chromatography. An additional cleanup is achieved by the extraction of phthalates from hexane into dimethyl formamide. Phthalates can then be confirmed by measurement of fluorescence in concentrated sulfuric acid. Analyses of spiked samples are reported Dibutyl phthalate was detected in eggs of double-crested cormorants (Phalacrocorax auritus) and herring gulls (Larus argentatus) in levels from 11 to 10 mcg/g lipid. Di-2-ethylhexyl phthalate was detected in hatchery-reared juvenile Atlantic salmon (Salmo salar) at 13-16 mcg/g lipid, and in the blubber of a common seal pup (Phoca vitulina) at 11 mcg/g lipid. (Holoman-Battelle)
W74-06129

PESTICIDES IN EFFLUENTS AND POLLUTED RIVER WATER,
Bradford Univ. (England). School of Biological Sciences.
K. H. Ali, and J. V. Wheelock.
International Journal of Environmental Analytical Chemistry, Vol 2, No 4, p 261-272, 1973. 5 tab, 30 ref.

Descriptors: *Pesticides, *Gas chromatography, Water pollution, Effluents, *Chlorinated hydrocarbon pesticides, *Phosphothioate pesticides, *Chemical analysis, *Pollutant identification, Methodology, Solvent extractions, Sewage effluents, Industrial wastes, Water analysis, Separation techniques, Water sampling, Heptachlor, Aldrin, DDT, DDE, DDD, Dieldrin, Organophosphorus pesticides, Hydrogen ion concentration, Pollutants, Insecticides, Water analysis.
Identifiers: Chemical recovery, Cleanup, Sample preparation, Wool-scouring mills, alpha-BHC, gamma-BHC, beta-BHC, Malathion, Retention time, Parathion, Heptachlor epoxide, alpha-Chlordane, o p' DDE, Endosulfan, beta-Chlordane, p p'DDE, p p' DDD, o p' DDT, p p' DDT, Endosulfan I, p p' TDE, p p' DDE, o p' DDE, River Aire, Isomers, Gas liquid chromatography, Chromogenic reagents, Organic solvents, Thin layer chromatography, Solvent systems, p p' Methoxychlor.

A procedure using gas-liquid chromatography has been devised for the simultaneous analysis of a range of pesticides in the River Aire. It was essential to incorporate a clean-up system because the river is so heavily polluted. In the cleanup procedure, the extract was partitioned with dimethyl formanide saturated with hexane, reduced in volume with clean air, passed through an alumina column, eluted with hexane, and spotted on thin layer plates or injected on to a gas chromatograph. The thin-layer chromatographic identifications were used to confirm the information obtained by gas-liquid chromatography. Spiked samples of river water and effluent were analyzed by GLC and the recoveries were calculated. For most of the pesticides, recovery was greater than 85 per cent. The unspiked samples showed that alpha-BHC, gamma-BHC and dieldrin were usually present. Malathion, DDT, and DDE were detected occasionally. It is suggested that the pesticides originate in wool-scouring mills, the mill effluents entering the river via the Bradford Corporation Sewage Works. (Holoman-Battelle)
W74-06130

CHEMILUMINESCENCE ANALYSIS FOR TRACE POLLUTANTS,
Environmental Protection Agency, Athens, Ga. Southeast Water Lab.
W. R. Seitz, and D. M. Hercules.
International Journal of Environmental Analytical Chemistry, Vol 2, No 4, p 273-290, 1973. 10 fig, 6 tab, 30 ref.

Descriptors: *Pollutant identification, Methodology, *Trace elements, *Chemical reactions, Chemical analysis, Iron, Chromium, Catalysts, Hydrogen ion concentration, Chelation, Flow

rates, Pollutants, Heavy metals, Volumetric analysis, Nickel, Cobalt, Manganese, Copper, Ion exchange, Separation techniques, Oxygen, Bromine, Iodine, Cations, Anions.
Identifiers: *Trace levels, *Chemiluminescence, Luminol, Sensitivity, Detection limits, Vanadium, Complexation, Hypochlorite, Permanganate.

The sensitivity of luminol chemiluminescence to small catalyst concentrations can be exploited for environmental analysis in several ways. Selective methods for Cr(III) and Fe(II) in complex solutions have been applied to natural samples. The detection limits are 0.03 mcg/l and 0.005 mcg/l, respectively. Species that do not catalyze luminol chemiluminescence can be determined by titration with reagents that catalyze the reaction. For example, arsenic and aqueous sulfur dioxide can be titrated with iodine, an efficient catalyst. MnO4(-), OCl(-), V(II), and Cr(II) are other catalysts that can be used as titrants. Preliminary ion exchange separation in concentrated LiCl solutions extends chemiluminescence to other catalysts of the luminol reaction: Ni(II), Co(II), Mn(II), Cu(II), and V(IV). (Holoman-Battelle)
W74-06131

THE DETERMINATION OF TRACE TRANSITION ELEMENTS IN BIOLOGICAL TISSUES USING FLAMELESS ATOM RESERVOIR ATOMIC ABSORPTION,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
D. A. Segar, and J. L. Gilio.
International Journal of Environmental Analytical Chemistry, Vol 2, No 4, pp 291-301, 1973. 5 tab, 26 ref.

Descriptors: *Spectrophotometry, *Trace elements, *Chemical analysis, *Pollutant identification, *Plant tissues, Methodology, Marine animals, Marine plants, Heavy metals, Cadmium, Cobalt, Copper, Iron, Manganese, Nickel, Lead, Zinc, Marine algae, Invertebrates, Grasses, Solvent extractions.
Identifiers: *Animal tissues, *Heated graphite atomizer, Flameless atomic absorption spectrophotometry, Sample preparation, Biological samples, Vanadium, Silver, Orchard leaves, Sponges, Thalassia testudinum, Laurencia poitei, Penicillus capitatus, Chondrilla mucula, Haliclona molitba.

The development of an analytical technique generally applicable to the determination of Ag, Cd, Co, Cu, Fe, Mn, Ni, Pb, V, and Zn in all biological tissues is described. All of these elements may readily be determined in tissue samples of less than 0.5 g using flameless atom reservoir atomic absorption with a Perkin-Elmer heated graphite atomizer. Some of the operational characteristics of this atomizer system are discussed. The utility of the method is illustrated by analyses of selected marine biota and of NBS standard orchard leaves. (Holoman-Battelle)
W74-06132

AUTOMATION OF DIRECT POTENTIOMETRY,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
I. Sekerka, and J. Lechner.
International Journal of Environmental Analytical Chemistry, Vol 2, No 4, p 313-322, 1973. 2 fig, 6 tab, 15 ref.

Descriptors: *Automation, Methodology, *Electrochemistry, Automatic control, Ammonia, Fluorides, Water analysis, Adsorption.
Identifiers: *Potentiometry, *Ion selective electrodes, Glass electrodes, Sampling rate, Ammonium, Chemical recovery, Chemical concentration, Precision.

A simple, versatile, automated direct potentiometry is described. It offers a wide range of possible applications for all types of ion-selective electrodes, including the glass electrode. The apparatus consists of two Fisher turntable sample changers connected to an Orion automatic switch, Orion pH/mV meter, and Orion printer system via a control module. The optimum sampling rate is 20 samples per hour F(minus) and NH(plus) in water samples as determined by using commercially available ion-selective electrodes. (Holoman-Battelle)
W74-06133

A SELECTIVE MICROSCALE X-RAY FLUORESCENCE ANALYZING METHOD FOR DETERMINATION OF TRACE ELEMENTS,
Jyvaskyla Univ. (Finland). Dept. of Physics.
P. Puumalainen, P. Suominen, J. Hattula, and H. Kalm.
International Journal of Applied Radiation and Isotopes, Vol 24, No 11, p 617-620, November 1973. 4 fig, 7 ref.

Descriptors: *Methodology, *X-ray fluorescence, *Trace elements, *Pollutant identification, Organic wastes, Selectivity, Heavy metals, Organic compounds, Irradiation, Chemical analysis.
Identifiers: *Trace levels, Accuracy, Sample preparation.

A new selective X-ray fluorescence analyzing method for trace element determination has been developed. In this method each trace element is measured independently. The excitation source is an X-ray tube that has a changeable anode and a variable high voltage. The exciting radiation is shaped with critical absorbers. The sample is viewed at backward angles through an absorber to reduce backscattered radiation. The estimated accuracy of this method is of the order of 10 percent in the sub-ppm range of trace element concentration in organic samples. Measurement times are of the order of a few minutes. (Holoman-Battelle)
W74-06135

IDENTIFICATION OF SUBSTANCES IN PETROLEUM CAUSING OBJECTIONABLE ODOUR IN FISH,
Okayama Univ. (Japan). Dept. of Public Hygiene.
M. Ogata, and Y. Miyake.
Water Research, Vol 7, No 10, p 1493-1504, October 1973. 11 fig, 4 tab, 9 ref.

Descriptors: *Pollutant identification, Marine fish, *Mass spectrometry, *Isolation, *Oil pollution, Sea water, Industrial wastes, Chemical analysis, Odor, Oil industry, Organic compounds, Eels, *Gas chromatography, Water pollution, *Spectrophotometry.
Identifiers: *Odor-producting substances, Petroleum hydrocarbons, Ultraviolet absorption spectrophotometry, Infrared absorption spectrophotometry, Flame ionization gas chromatography, Aromatic hydrocarbons, Aliphatic hydrocarbons, Animal tissues, Sample preparation, Toluene, Gasoline, Benzene, o-Xylene, m-Xylene, p-Xylene, Infrared absorption spectra, Ultraviolet absorption spectra, Mass spectra, Muscle, Liver.

In order to identify substances causing an offensive-odour in fish from the sea facing petroleum and petrochemical industries, analyses have been made on seawater, industrial waters, fish and eels kept in the sea or industrial waste for a certain period, by means of gas chromatography, i.r., u.v. absorption and mass spectrometry. Observations revealed toluene as a possible main cause of the odour. Finally, by analysing the meat extract of fish kept in seawater containing toluene which had the same smell as that of the offensive-smelling fish from near the oil refineries, it has been confirmed that toluene imparts the offensive-odour to fish near Mizushima. By gas chromatographic analysis of eels kept alive experimentally in seawater containing oil and their components, it has been proved that aromatic hydrocarbons (benzene and o-, m- and p-xylene) other than toluene and some aliphatic hydrocarbons are also probable substances that impart an offensive-odour to fish. Gasoline rich in olefine imparts offensive-odour to fish more than gasoline rich in paraffin or naphthene. (Holoman-Battelle)
W74-06140

TRACE METALS ANALYSIS ON SMALL OIL SAMPLES,
Texaco, Inc., Richmond, Va. Richmond Research Labs.
H. P. Woods.
Applied Spectroscopy, Vol 27, No 6, p 490, November/December 1973. 1 tab.

Descriptors: *Pollutant identification, *Trace elements, *Chemical analysis, *Oil, Heavy metals, Iron, Lead, Copper, Aluminum, Chromium, Boron, Methodology.
Identifiers: *Emission spectroscopy, *Trace levels, Lubricating oil, Motor oil, Silicon.

Quantities of oil as small as 0.5 ml have been analyzed for trace metals by direct reading emission spectroscopy with satisfactory results. A plastic cup was made as a sample holder. The capacity of this plastic container is approximately 3 ml; however, the container is partially filled with deionized water, and then the oil sample is floated on top of the water. Since the disc acts as a rotating skimmer, immersion of the disc to less than 1 mm is all that is needed for adequate sampling. This technique permits tests to be run routinely without modification to instrument or sample container. A similar technique could possibly be employed in the analysis of oils involving questions of environmental pollution, where after extensive concentration only a limited amount of samples may be available. (Holoman-Battelle)
W74-06142

RESPONSE TIME OF HIGH-FREQUENCY OSCILLATOR-TYPE PROXIMITY DETECTORS,
For primary bibliographic entry see Field 7B.
W74-06144

PROGRAMMABLE TEMPERATURE CONTROLLERS,
Indian Inst. of Tech., Bombay.
For primary bibliographic entry see Field 7C.
W74-06145

A COMPUTER-BASED TELECONTROL AND COMMUNICATIONS SYSTEM FOR A WATER SUPPLY NETWORK,
For primary bibliographic entry see Field 7C.
W74-06146

A SIMPLE TURBIDIMETER FOR RAPID DETERMINATION OF LOW BACTERIA CONCENTRATIONS,
Consiglio Nazionale delle Ricerche, Naples (Italy). Laboratorio di Cibernetica.
A. Piccialli, and S. Piscitelli.
Review of Scientific Instruments, Vol 44, No 12, p 1717-1719, December 1973. 5 fig, 6 tab, 6 ref.

Descriptors: *Cultures, *Measurement, *Bacteria, Aquatic environment, Turbidity, Density, *Instrumentation.
Identifiers: *Turbidimeters, Bacterial concentration.

For detecting bacterial concentrations in very dilute media, a turbidimeter has been developed which reaches a sensitivity some three orders of magnitude greater than commercial instruments and without highly sophisticated photometric techniques. This differential photometric ratio systems consists of two photovoltaic cells which, operated in the linear section of their curves and

connected back-to-back, detect the intensity variations of the two optical paths. Staphylococcus aureus were used to measure the sensitivity of the instrument. Decreasing bacterial concentrations were read in triplicate; under the experimental conditions used, it is possible to reach the sensitivity in the range of 10,000-1,000,000 cells/ml. The advantages of this method with respect to the conventional ones are that the rapid and direct measurements of low bacterial densities offer new possibilities for the study of basic microbiological problems in natural aquatic ecosystems where bacteria are usually present in very low densities. (Holoman-Battelle)
W74-06147

AUTOMATIC RECORDING DILATOMETER,
Montreal Univ., (Quebec). Dept. of Chemistry.
P. Bernatchez, and D. Goutier.
Review of Scientific Instruments, Vol 44, No 12, p 1790-1791, December 1973. 2 fig, 1 tab, 8 ref.

Descriptors: *Automatic control, *Volume, *Variability, *Measurement, Automation, Electrical conductance, *Instrumentation.
Identifiers: *Dilatometers, Precision.

A dilatometer and an apparatus are presented which automatically records the height of the mercury column as a function of time. The precision of changes of 30 cm in height may attain plus or minus 0.007 cm. The stability of the electrical circuitry is such that measurements may span over several weeks. The measurement is based on electrical conductivity. An application is reported. (Holoman-Battelle)
W74-06148

THE STANDARD POTENTIAL OF THE SINGLE-CRYSTAL COPPER ELECTRODE IN AQUEOUS SOLUTIONS,
Copenhagen Univ. (Denmark). H. C. Oersted Inst.
For primary bibliographic entry see Field 2K.
W74-06149

EVALUATION OF MALONATE DULCITOL LYSINE IRON AGAR FOR PRESUMPTIVE IDENTIFICATION OF SALMONELLAE,
Oregon State Dept. of Agriculture, Salem. Lab. Services.
J. R. Stroup.
Journal of the Association of Official Analytical Chemists, Vol 57, No 1, p 95-100, January 1974. 4 tab, 12 ref.

Descriptors: *Pollutant identification, *Salmonella, Enteric bacteria, Pathogenic bacteria, Aerobic bacteria, Pollutants, E. coli, Shigella, Coliforms.
Identifiers: *Culture media, *Serotypes, *Iron agar(Malonate dulcitol lysine), Arizona hinshawii, Edwardsiella, Klebsiella, Proteus, Citrobacter, *Salmonellae, Method evaluation.

Malonate dulcitol lysine iron agar (MDLI) was evaluated, using 173 Salmonella subgenus I (19 serotypes) from 129 samples and 140 Salmonella subgenus III (Arizona hinshawii) from 17 samples. Sixty-four stock cultures were tested including 3 Salmonella subgenus II, 5 Salmonella subgenus IV, and 5 Edwardsiella tarda. Three hundred thirty-five non-Salmonellae from 81 samples were also studied. Only the Edwardsiella cultures and 1 other non-Salmonellae gave aberrant results in MDLI. Five of the known Salmonella serotypes tested and 2 serotypes isolated from samples gave atypical results. If MDLI is used to differentiate the subgenera, and lysine iron agar is used to confirm lysine decarboxylase for subgenera II, III, and IV, as well as act as a source of cells for '0' group serology, then the results of this study indicate that 305 (97.4 percent) of the 313 Salmonellae isolated from samples gave typical reactions within 30 hr. Biochemical and serological tests should be used to confirm cultures that give positive reactions. (Holoman-Battelle)
W74-06150

METHODOLOGY FOR RECOVERY AND IDENTIFICATION OF ENTEROPATHOGENIC ESCHERICHIA COLI,
Food and Drug Administration, Washington, D.C. Div. of Microbiology.
I. J. Mehlman, A. C. Sanders, N. T. Simon, and J. C. Olson, Jr.
Journal of the Association of Official Analytical Chemists, Vol 57, No 1, p 101-110, January 1974. 3 tab, 34 ref.

Descriptors: *Pollutant identification, *E. coli, *Pathogenic bacteria, *Enteric bacteria, *Methodology, Coliforms, Aerobic bacteria, Shigella, Separation techniques.
Identifiers: Culture media, Selective media, Recovery, *Biochemical tests, Fecal coliforms, Citrobacter diversus, Citrobacter freundii, Enterobacter hafniae, Klebsiella pneumoniae, Aeromonas, Yersinia enterocolitica, Proteus, Providencia, Enterobacteriaceae, Biochemical reactions.

Pathogenic biotypes of E. coli have been incriminated in food-borne illness. Sensitivity to evaluated temperature and a typical behavior precluded assessment of their incidence. A tentative recovery procedure involves direct streak, pre-enrichment in MacConkey broth at 35 C and transfer to lauryl tryptose broth at 35C and transfer to lauryl tryptose broth with incubation at 44C. Serological examination of enrichment simplifies analysis. Levin's eosin methylene blue agar is recommended for rapid lactose fermenters; MacConkey's agar should be used for low fermenters. Primary screening reactions include H2S, arabinose, urease, o-nitrophenyl-beta-D-galactosidase, and indole. Secondary reactions comprise lysine decarboxylase, Voges-Proskauer (at 22C), and other tests required to differentiate E. coli from Citrobacter diversus, C. freundii, Enterobacter hafniae, Klebsiella pneumoniae, and Shigella species. Slide and tube agglutination reactions are necessary for identification of somatic and capsular antigens. Enhancement of motility by serial passage in a semisolid medium is essential for recognition of flagellar antigen. Confirmatory reactions include nitrate reduction, cytochrome oxidase, and Gram stain. Potentiality for quantitation, applicability to animal pathogens, and ecological samples are discussed. (Homoman-Battelle)
W74-06151

POLLUTION ANALYZERS FOR AIR AND WATER-WHO MAKES WHAT,
Crawford and Russell, Inc., Stamford, Conn.
B. G. Liptak.
Instrumentation Technology, Vol 21, No 1, p 43-45, January 1974. 1 fig, 10 ref.

Descriptors: *Instrumentation, *Pollutant identification, *Chemical analysis, *Water analysis, *Monitoring, *Water quality, Pollution abatement, Equipment, Air pollution, Water pollution, Measurement, Pollutants, Water quality control.

An extensive listing is given of manufacturers of analyzers for the more common air and water pollutants. (Holoman-Battelle)
W74-06153

EVALUATION OF EXISTING FIELD TEST KITS FOR DETERMINING FREE CHLORINE RESIDUALS IN AQUEOUS SOLUTIONS,
Army Medical Environmental Engineering Research Unit, Edgewood Arsenal, Md.
K. J. Guter, W. J. Copper, and C. A. Sorber.
Journal American Water Works Association, Vol 66, No 1, p 38-43, January 1974. 3 fig, 6 tab, 18 ref.

Descriptors: *Aqueous solutions, Methodology, *On-site tests, *Evaluation, *Chlorine, Colorimetry, Water temperature, Hydrogen ion concentration, Testing procedures, Chemical analysis, Water analysis, *Pollutant identification.
Identifiers: Precision, Synthetic water, Natural waters, Accuracy, Test kits, Syringaldazine procedure, N N-diethyl-p-phenylene diamine procedure, Comparative tests, Leuco crystal violet procedure, SNORT, Standard Methods.

An evaluation of five commercially available test-kit procedures that measure free available chlorine has been conducted on both synthetic water and five natural waters. The five techniques were syringaldazine (high range), syringaldazine (liquid), leuco crystal violet, N,N-diethyl-p-phenylene diamine (DPD), and SNORT, a neutral orthotolidine procedure. The following conclusions were drawn from results of the study. (1) Syringaldazine (liquid) was the most specific for FAC available (free chlorine) of the five test kits evaluated. (2) DPD was more accurate and precise over temperature and pH variation than were the other test-kits. (3) Syringaldazine (high range, leuco crystal violet, DPD, and SNORT all performed with satisfactory accuracy in the evaluation of natural waters. (4) Through 30 mg/l FAC, none of the test kits' colored-oxidized-indicator compounds was bleached by the high concentrations of FAC. (5) In evaluations of the natural water samples, only the organically polluted water resulted in appreciable false positive readings for the majority of the test kits. (6) Based upon the equilibrium constant, a negligible amount of HOCl will be present when combined chlorine concentrations in solutions are as high as 15 mg/l as C12. Therefore, false positive observations are probably due to some phenomenon other than reaction with HOCl present at equilibrium. (Mortland-Battelle)
W74-06162

THE DETERMINATION OF TANNIN AND LIGNIN,
Hach Chemical Co., Ames, Iowa. Technical Center.
M. B. Kloster.
Journal American Water Works Association, Vol 66, No 1, p 44-46, January 1974. 5 fig, 7 ref.

Descriptors: Methodology, *Pollutant identification, Water pollution, *Lignins, *Color reactions, *Spectrophotometry, Organic wastes, Organic compounds, Carbohydrates, Aromatic compunds, Industrial water, Waste water(Pollution), Chemical analysis.
Identifiers: *Chromogenic reagents, *Tannins, Folin-Ciocaltun reagent, Chemical interference, Precision, Chemical recovery, Phenolic compounds.

A new reagent has been developed that is not subject to some of the problems that arise with the traditional reagent presently recommended by 'Standard Methods' for determining tannin and lignin. The Folin-Denis, Folin-Ciocalteu reagents in combination with a carbonate reagent were tested using a 5 mg/l tannic acid solution which was prepared fresh daily. A precipitate formed with the Folin-Denis reagent and incomplete color development resulted. With the Folin-Ciocalteu reagent color development was very rapid upon the addition the carbonate reagent. At 20C maximum intensity was reached in about 60 min. After 25 min of development, the rate slows appreciably and the test gives good results if the development time is held within plus or minus 2 min. For the most sensitivity without appreciable loss of reaction rate, a ratio of 5 ml carbonate reagent/25 ml sample is recommended. For the best accuracy, the test should be run at above 20C and the temperature should be held within plus or minus 2C. These conditions will result in an error of less than 0.5 percent T. Any phenolic compound will give a positive interference when present in the sample being tested for tannin or lignin. Other reducing substances, notably sulfite and ferrous iron, will also give a positive interference. At 700 nm using

10-mm sample cells in an instrument with a 0.5 nm bandpass Beer's Law was obeyed from 0 to 7 mg/l tannic acid. At a concentration of 5.00 mg/l tannic acid, the standard deviation was plus or minus 0.075. After the addition of tannic acid to cooling tower water, the recovery was 96.6 percent at a level of 5 mg/l tannic acied. (Holoman-Battelle)
W74-06163

ALUMINUM IN FLUORIDATED DRINKING WATER: ANALYTICAL AND PHYSIOLOGICAL PROBLEMS,
Institute of Dental Research, Praque (Czechoslovakia). Chemical Dept.
J. A. Ruzicka, and L. Mrklas.
Journal American Water Works Association, Vol 66, No 1, p 53-55, Janurary 1974. 2 tab, 12 ref.

Descriptors: *Aluminum, *Potable water, *Fluorides, *Water pollution effects, Hydrogen ion concentration, Water quality, Spectrophotometry, Anions, Cations.
Identifiers: Sodium fluoride, Aluminum sulfate, Mice, Biological samples.

This study attempts to discover the relationship between free fluoride ion concentration and fluorine utilization by experimental mice administered solutions at different pH levels. The mice were fed a standard diet containing 2.4 mg fluorine per 1 kg dry weight. Five groups of thirteen animals each were formed, all of which were given distilled water to which was added sodium fluoride and aluminum sulphate, NaF and A12(SO4)3.18H20 at different pH levels. On termination of the experiment (the 21st day), the animals were sacrificed and the fluorine content in the ash of the tibiae was determined spectrophotometrically without separating the fluorine by distillation. Results have shown a decreased utilization of fluorine in solutions with a lower pH. At high pH levels the utilization of fluorine gradually increases. The fluorine interacts with the aluminum flocculant present in the solution. The utilization of fluorine is more influenced by aluminum cations than by aluminate anions, even though the utilization of fluorine is also reduced by aluminate. There was an obvious dependence of the proportion of free fluoride ion and also of total fluorine used by a living organism on an increased pH. However, the fluoride ion can by no means always be considered the main component of usable fluorine. Total fluorine determination seems to be a much better criterion. (Mortland-Battelle)
W74-06164

LAKES OF OREGON: VOLUME ONE, CLATSOP, COLUMBIA, AND TILLAMOOK COUNTIES,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 2H.
W74-06270

AN INEXPENSIVE TITRATION METHOD FOR THE DETERMINATION OF ORGANIC CARBON IN RECENT SEDIMENTS,
New Hampshire Univ., Durham. Dept. of Earth Sciences.
H. E. Gaudette, W. R. Flight, L. Toner, and D. W. Folger.
Journal of Sedimentary Petrology, Vol 44, No 1, p 249-253, March 1974. 1 fig, 2 tab, 11 ref.

Descriptors: *Water analysis, *Carbon, *Organic matter, *Sediments, Laboratory tests, Laboratory equipment, *Volumetric analysis.

Thirty-three samples of lacustrine and shallow marine sediments were analyzed for organic carbon content by a modified Walkey-Black titration method and by the LECO combustion method. Comparison of the two sets of data yields a regression line with a slope of 0.992, intercept of 0.00 and a correlation coefficient of 0.989; results obtained with the two methods agree precisely. Because the titration method involves little equipment or operator training it can be used at small laboratories and schools that lack sufficient funds or volume of samples to purchase or justify the faster but more expensive LECO apparatus. (Knapp-USGS)
W74-06284

OCCURRENCE AND ANALYSIS OF PETROLEUM HYDROCARBONS IN THE AQUATIC ENVIRONMENT,
Geological Survey, Menlo Park, Calif.
M. L. Yates.
Open-file report, January 1974. 40 p, 49 ref.

Descriptors: *Oil spills, *Pollutant identification, Gas chromatography, *Spectrophotometry, Fluorescence, Biodegradation, Sampling, *Water pollution sources, *Oil pollution.

Major sources of oil spills include crude oil production, manufacture of refined petroleum and petrochemicals and transportation and marketing of oil products. In 1970 over 2 million tons was lost to the marine environment. This amount will increase to an estimated 5 million tons per year by 1980. To be able to characterize and estimate the amount of hydrocarbon residue it is necessary to have analytical techniques for the determination of petroleum and natural hydrocarbons in the aquatic environment. Usually solvent extraction of an environmental sample is followed by an analytical cleanup step which also may provide some chemical class separations. Qualitative characterization is primarily by flame ionization gas chromatography. Infrared spectrometry, fluorescence and elemental analysis are often required for complete analysis. Both qualitative and quantitative assessments are made more difficult by degradation from weathering and biological transformation occurring within the aquatic environment. (Knapp-USGS)
W74-06289

SURFACE OBSERVATIONS, GROUND TRUTH AND DATA, NASA-USGS MISSION 144, CHESAPEAKE BAY REGION, SEPT. 22-30, 1970,
Virginia Inst. of Marine Science, Gloucester Point.
M. M. Nichols.
Data Report No 10, July 1971. 33 p, 2 fig, 6 append. USGS Eros Contract 14-08-001-12540.

Descriptors: *Remote sensing, *Atlantic Coastal Plain, *Aerial photography, Land use, *Data collections, Water quality, Sedimentation, Urbanization, *Water pollution, *Chesapeake Bay.

Surface observations of coastal waters in the Chesapeake Bay region and ground truth data were obtained to aid interpretation and analyses of overflight photography and imagery. Among the objectives of the mission was to investigate the potential of high-altitude, multispectral photography. The site encompasses a major segment of the mid-Atlantic coast from Newark, New Jersey to Wilmington, North Carolina. It includes the southern portion of Megalopolis, one of the world's major urban-industrial complexes. It encompasses the silt and pollutant laden Chesapeake drainage system, the largest on the U.S. east coast. The site includes seaward reaches of the Delaware River system where water quality management is the chief problem. Additionally, it includes the coastal parts of North Carolina which offers a wide range of physical environments and cultural development common to the east coast. Large spatial and temporal variations occur in these tidal waters. (Knapp-USGS)
W74-06300

ARSENIC AND ANTIMONY IN THE TROPICAL ZONE OF THE ATLANTIC OCEAN (MYSH'YAK I SUR'MA V TROPICHESKOY ZONE ATLANTICHESKOGO OKEANA),
Akademiya Nauk URSR, Sevastopol. Marine Hydrophysics Inst.
For primary bibliographic entry see Field 2K.
W74-06309

FLUORINE IN SOME NATURAL WATERS OF TADZHIKISTAN (FTOR V NEKOTORYKH PRIRODNYKH VODAKH TADZHIKISTANA),
Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Khimii.
For primary bibliographic entry see Field 2K.
W74-06310

THE CONTENT OF SOME NATURAL RADIOACTIVE ELEMENTS, ESPECIALLY RN-222, IN SOME POTABLE WATERS IN SWEDEN,
National Inst. of Radiation Protection, Stockholm (Sweden).
For primary bibliographic entry see Field 2K.
W74-06372

UTILIZATION OF BARK WASTE,
Oregon State Univ., Corvallis. Dept. of Forest Products.
R. A. Currier, and M. L. Laver.
Available from the National Technical Information Service as PB-221 876; $6.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Cincinnati, Ohio, Final Project Report EPA-670/2-73-005, 1973. 179 p, 7 fig, 14 tab, 88 ref.

Descriptors: *Wood wastes, *Bark, *Solid wastes, *Waste disposal, Ultimate disposal, *Economic feasibility, *Marketing, Research and development, Particle size, Particle shape, Softwood, Ammonia, Bonding, Adhesion, Cohesion, Moisture content, Carbohydrates, Chemical analysis.
Identifiers: Wood products, Pellets, Molded wood articles, Pelleting(Pelletizing), Plant waxes, Chemically modified wood, Bark extractives.

In attempts to find economic market potentials for vast amounts of tree bark waste generated by the wood-using industries, research studies were conducted on (1) the preparation of bark pellets under controlled conditions and process variables, such as particle size and shape, moisture content, and addition of chemical reagents; (2) the identification of components responsible for self-bonding of bark, such as carbohydrates, waxes, and related extractives; (3) the preparation of ammoniated and other chemically modified bark products; (4) the chemical analysis of bark products, such as bark that had been molded into pellets and then comminuted. Progress along each of these approaches is reported, and recommendations for further investigations are made. (Brown-IPC)
W74-06379

THE PCB STORY,
S. Jensen.
Ambio. Vol 1, No 4, p 123-131. 1972. Illus.
Identifiers: *Eagle(White-tailed), Japan, Law, *Pike, *Salmon, *Sweden, Reviews, *Pollutant identification, *Polychlorinated biphenyls.

The history of, and difficulties inherent in, the identification of polychlorinated biphenyls in the environment are related. The identity of unknown substances in a white-tailed eagle found dead in the archipelago of Stockholm, Sweden, and young salmon and pike was verified by a comparison with the mass spectrometric and gas chromatographic data of a synthetic chlorinated biphenyl mixture. Literature reviews on world wide research and scientific articles concerning contaminants and stability are cited. The uses of PCB in Sweden, biological effects, the law ban in Sweden and a comparison of blood levels in some Japanese and Swedish people are discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-06393

CHROMATOGRAPHIC DETERMINATION OF DIHYDRIC PHENOLS IN WASTE WATER (STANOVENI OBSAHU DVOJMOCNYCH FENOLU V ODPADNICH VODACH POMOCI CHROMATOGRAFIE),
Ustav pro Vyzkum a Vyuziti Paliv, Bechovice (Czechoslovakia).
J. Novotny.
Vodni Hospodarstvi, Vol 22, No 4, p 96-100, 1972. 6 fig, 2 tab, 15 ref.

Descriptors: Water analysis, *Analytical techniques, *Phenols, *Chromatography, *Pulp wastes, Solvents, Water pollution sources, Monitoring, Effluents, Waste water(Pollution), *Pollutant identification.
Identifiers: Pyrocatechol, Hydroquinone, Resorcinol.

A descending paper chromatographic technique is described which was used in conjunction with photocolorimetry to determine pyrocatechol, 4- and 3-methyl and 4-ethyl pyrocatechols, methyl ethyl pyrocatechol, hydroquinone, and resorcinol in effluent samples from various pulp and paper mills. The substrate used was Whatman No. 1 filter paper preconditioned by saturation with water vapor for 3 days at 20 C. The developing solvent was a mixture of 94 parts (v/v) of carbon tetrachloride, 6 parts of n-butyl alcohol, and 100 parts of water. This solvent mixture advanced at the rate of 500 mm per 5-9 hr. Dried chromatograms were developed with ammoniacal silver nitrate solution and stabilized, after washing, with aqueous sodium thiosulfate solution. (Trubacek-IPC)
W74-06396

PHENOLIC COMPOUNDS IN SPENT PULPING LIQUORS AND PULP MILL EFFLUENTS (ZWIAZKI FENOLOWE W LUGACH I SCIEKACH Z CELULOZOWNI),
Instytut Celulozowo-Papierniczy, Warsaw (Poland).
B. Pszonka.
Przeglad Papierniczy, Vol 29, No 7, p 254-256, July 1973. 33 ref.

Descriptors: *Phenols, Water analysis, *Colorimetry, Toxicity, *Pulp wastes, *Sulfite liquors, *Lignins, Analytical techniques, Effluents, Pulp and paper industry, Europe, *Pollutant identification.
Identifiers: Sulfite pulp mills, Spent sulfite liquors, Poland.

Contrary to optimistic views reported by earlier investigators abroad, recent gas-chromatographic analyses of sulfite pulp mill effluents indicate that the degradation of lignin can and does give rise to toxic simple phenolic compounds, such as phenol, cresols, and xylenols. Most antipollution standards are based on colorimetry of phenols, using various reagents, such as 4-aminoantipyrine, p-nitroaniline, and tungsten-molybdenum reagent. These reactions may be sensitive, but are nonspecific. They detect all phenolic compounds, including vanillin and other nontoxic components of mill discharges. The detectable amounts of phenols also vary with different reagents used. Further refinement of analytical techniques and better knowledge of the biodegradation of wood-derived effluent components are desirable objectives of future research. (Stapinski-IPC)
W74-06400

RAPID DETERMINATION OF CHEMICAL OXYGEN DEMAND IN WASTE WATERS OF WOOD-CHEMICAL FACTORIES (USKORENNOE OPREDELENIE KHPK STOCHNYKH VOD ASHINSKOGO LESOKHIMICHESKOGO KOMBINATA),
G. A. Ishcherikova, and N. P. Drozdov.
Gidroliznaya i Lesokhimicheskaya Promyshlennost', No 6, p 25-27, 1973. 2 tab, 1 ref.

Descriptors: *Chemical oxygen demand, *Water analysis, *Analytical techniques, *Pulp wastes, Waste water(Pollution), Monitoring, Oxygen demand, Water pollution sources, Industrial wastes, Foreign research, *Pollutant identification.
Identifiers: Potassium dichromate, USSR.

Because the standard dichromate method of COD determination requires ca. 2 hr of sample heating, an accelerated modification was developed at the Ashinsk wood-processing factory in the USSR. Its principle is the same as in the standard method, but the heating time is shortened to 15 min. A 10-ml sample of the waste water to be tested is mixed with potassium dichromate with gradual addition of sulfuric acid. If chlorides are present, a small amount of mercury sulfate is added. The mixture is heated on a sand bath for 15 min, then cooled, diluted with water, and titrated with 0.1N solution of Mohr's salt in the presence of 0-phenanthroline. The rapid method was tested on effluents of rosin and turpentine manufacturing plants and showed good agreement with results of the longer standard method. (Stapinski-IPC)
W74-06406

EMISSION SPECTROMETRIC DETERMINATION OF ARSENIC,
Colorado State Univ., Fort Collins. Dept. of Chemistry.
F. E. Lichte, and R. K. Skogerboe.
Anal Chem. Vol 44, No 8, p 1480-1482. 1972. Illus.
Identifiers: *Arsenic, *Wyoming(Yellowstone National Park), *Pollutant identification, *Spectrophotometry, Pools, Trace elements.

An arsine generator was coupled directly to the excitation plasma, and the generator system was optimized to permit the rapid, quantitative removal of arsenic from an aqueous sample obtained from Morning Glory Pool in Yellowstone National Park. The system offered high sensitivity; the detection capability, which was primarily limited by the reagent blank, was approximately 5 ng. Less than 5 parts per billion of arsenic were determined when a 1-ml sample was used. The sensitivity that was obtained, coupled with the relative simplicity of the instrumentation required, suggested that this method should find widespread application in problems requiring the determination of trace amounts of arsenic.--Copyright 1973, Biological Abstracts, Inc.
W74-06499

5B. Sources Of Pollution

NITROGEN BUDGET OF A NORTH CAROLINA ESTUARY,
North Carolina State Univ., Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-05954

CHEMICAL AND SEDIMENT MOVEMENT FROM AGRICULTURAL LAND INTO LAKE ERIE, SUPPLEMENT REPORT,
Ohio State Univ., Dept. of Agricultural Engineering.
G. O. Schwab, and E. O. McLean.
Available from the National Technical Information Service as PB-230 515, $3.00 in paper copy, $1.45 in microfiche. Ohio State University, Water Resources Center, Supplement Report, Project 390X, November 1973. 15 p, 9 tab, 3 ref. OWRR A-018-OHIO (2), 14-01-0001-3535.

Descriptors: *Water quality, *Sediment discharge, *Pesticide removal, Drainage systems, Drainage water, Nitrogen, Phosphorus, Nutrient removal, *Lake Erie, *Ohio, Tile drains, Clays, Oats, Runoff, Heavy metals, Alfalfa, Iron, Lead.
Identifiers: Sandusky(Ohio).

Water quality from tile drains and surface runoff was measured from half acre plots on Toledo silty clay soil near Sandusky, Ohio, in 1972. Crop was oats in early part of the growing season followed by plowing and seeding to alfalfa in September. Relative losses of sediment and chemical ions for the two drainage systems were similar to those of the previous three years. Growing season sediment losses from the tile drains were 3,714 lbs per acre in 1972 compared to an average of 1,071 lbs per acre for 1969-71. The corresponding losses from surface drains were 6,854 and 1,287 lbs per acre. All pesticide losses were insignificant, but none were applied in 1972. Annual losses of eight heavy metals in 1972 were estimated to be less than 10 lbs per acre, except for iron (34-59) and lead (11-15 lbs per acre). (See also W73-01957)
W74-05955

TRANSFER OF HEAVY METAL POLLUTANTS FROM LAKE ERIE BOTTOM SEDIMENTS TO THE OVERLYING WATER,
Bowling Green State Univ., Ohio. Dept. of Geology.
L. J. Walters, Jr., and T. J. Wolery.
Available from the National Technical Information Service as PB-230 380, $4.00 in paper copy, $1.45 in microfiche. Ohio State University Water Resources Center Project Completion Report No. 421X, January 1974. 84 p, 12 fig, 7 tab, 60 ref. OWRR A-032-OHIO (1).

Descriptors: *Mercury, *Chromium, *Nickel, *Mass transfer, *Sedimentation rates, *Lake Erie, Diffusion, Heavy metals, Water pollution sources, Path of pollutants, Sediment-water interfaces, *Bottom sediments.

Analyses of surface waters, surface microlayers, and interstitial waters all showed negligible mercury contents in Lake Erie samples. A series of extractions on six sediment samples showed that the mercury was present in essentially three components: (1) high molecular-weight organic acids (30-54%), 2) lower molecular-weight organic acids believed to be held as insoluble complexes with iron under in situ conditions (5-20%), and (3) a sulfide (plus refractory organic) component (24-62%). Detailed depth profiles for mercury, nickel, and chromium in Lake Erie sediment cores showed that mercury was enriched in the surface sediments up to 114 times background levels. Chromium was typically enriched by a factor of 2-7, and nickel from 1-2. Geographically, the Western Basin showed the highest degree of heavy metal enrichment, and the Eastern Basin the least. Pollutant mercury horizons were used to obtain sedimentation rates in the Western Basin. A simplified model for the effect of sedimentation rate on the eventual remobilization of mercury via methylation showed two areas of high relative remobilization. The high sedimentation rates appear to be capable of negating the mercury hazard in the rest of the Basin without assistance from man.
W74-05956

RIVERINE RECREATIONAL DEVELOPMENT--MATHEMATICAL MODELING,
Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Civil Engineering.
R. M. Shane, H. J. Day, S. M. Frenkil, and P. H. P. Ho.
Available from the National Technical Information Service as PB-230 434, $7.50 in paper copy, $1.45 in microfiche. Interim Research Report R735-5, September 1973. 83 p, 15 fig, 21 tab, 21 ref. OWRR C-2183(3381) (1).

Descriptors: *Water quality, *Recreation, Mathematical models, *Pennsylvania, Planning, Urban sociology, Water sports, Rivers, Recreation demand, Swimming, Fishing, Boating, *Computer models, *Simulation analysis.
Identifiers: *Urban recreation, Pittsburgh(Penn), *Allegheny River(Penn).

A computer simulation model is being developed to make water quality projections for planning urban recreation. These projections should reflect basin-wide waste load contributions from both point and nonpoint sources of pollution. The model should project expected pollutant concentrations at key recreational areas in such a way that they reflect alternative socioeconomic and land use projections for the watershed area as well as alternative treatment strategies for point and areal sources of pollution. Another model should project recreational participation at individual sites in a region according to points of origin as well as user characteristics that include age and income. The model should include a water quality parameter to allow the effects of deteriorating or improving water quality conditions to be reflected in the recreational participation projections. One of the goals of this research is to evaluate the recreational potential of the Allegheny River, particularly that portion closest to the city of Pittsburgh. The present water quality of the Allegheny River is suitable for boating and general fishing; BUT IT IS NOT SUITABLE FOR SWIMMING OR ACTIVE GAME FISHING AT THIS TIME. (Knapp-USGS)
W74-05958

THE PROPERTIES OF SLUDGES,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W74-05967

CHARACTERISTICS OF MUNICIPAL EFFLUENTS,
Metcalf and Eddy, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 5D.
W74-05968

THE PHYSICAL PROCESSES IN THE SOIL AS RELATED TO SEWAGE SLUDGE APPLICATION,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 5D.
W74-05970

PHYSICAL CHANGES TO SOILS USED FOR LAND APPLICATION OF MUNICIPAL WASTE--WHAT DO WE KNOW, WHAT DO WE NEED TO KNOW,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 5D.
W74-05971

SOIL MICROBIOLOGICAL ASPECTS OF RECYCLING SEWAGE SLUDGES AND WASTE EFFLUENTS ON LAND,
Ohio State Univ., Columbus.
For primary bibliographic entry see Field 5D.
W74-05972

INORGANIC REACTIONS OF SEWAGE WASTES WITH SOILS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5D.
W74-05973

ORGANICS,
California Univ., Davis.
For primary bibliographic entry see Field 5D.
W74-05974

LAND TREATMENT OF LIQUID WASTE: THE HYDROLOGIC SYSTEM,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 5D.
W74-05975

LAND RESOURCES,
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-05976

MONITORING CONSIDERATIONS FOR MUNICIPAL WASTEWATER EFFLUENT AND SLUDGE APPLICATION TO THE LAND,
Michigan Dept. of Natural Resources, Lansing.
For primary bibliographic entry see Field 5D.
W74-05984

LAKE ERIE, OHIO, PENNSYLVANIA, NEW YORK INTAKE WATER QUALITY SUMMARY, 1970.
Environmental Protection Agency, Chicago, Ill. Region V.
Available from NTIS, Springfield, Va 22151 as PB-214 946. Price $6.00 printed copy; $1.45 microfiche. Cooperative Program Report, August 1971. 311 p, 1 fig, 8 tab.

Descriptors: *Water quality, *Lake Erie, *Municipal water, Water analysis, Water chemistry, Dissolved oxygen, Data collections, Hydrologic data, *New York, *Pennsylvania, *Ohio, Intake.

A summary of progress is given for the cooperative water quality surveillance program between the Ohio Department of Health, New York State Department of Environmental Conservation, Pennsylvania Department of Environmental Resources, municipalities, and the Environmental Protection Agency at 22 water treatment intakes in Lake Erie. Analytical characterizations include continuous temperature recording, pH, conductivity, total dissolved (filterable) solids, turbidity, total iron, total manganese, chloride, sulfates, total bacteria, total and fecal coliforms, alkalinity, hardness, and chlorine demand. In addition, analytical characterizations on Buffalo's intake water include color, total solids, biochemical oxygen demand, chemical oxygen demand, total phosphorus, fluoride, and methylene blue active substance (anionic detergents). In addition, the EPA is making the following biweekly determinations; DO, turbidity, total solids, total dissolved (filterable) solids, total suspended (nonfilterable) solids, dissolved silica (Si02), total phosphorus, soluble phosphorus, organic nitrogen, ammonia, nitrate, chemical oxygen demand, total coliforms, fecal coliforms, total bacterial counts (SPC), and plankton evaluations. (Knapp-USGS)
W74-05987

ON MULTIDISCIPLINARY RESEARCH ON THE APPLICATION OF REMOTE SENSING TO WATER RESOURCES PROBLEMS,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 7B.
W74-05988

BOMB-PRODUCED TRITIUM IN THE ANTARCTIC OCEAN,
Scripp: Institution of Oceanography, La Jolla, Calif.
R. Michel, and P. M. Williams.
Earth and Planetary Science Letters, Vol 20, No 3, p 381-384, November 1973. 2 fig, 1 tab, 12 ref. NSF Grant 25952 and GV-27110.

Descriptors: *Tritium, *Ocean circulation, *Sea water, *Antarctic, Water circulation, Ocean currents, Mixing, Tracers, Fallout.

Tritium measurements for 24 samples from the Antarctic Ocean are given. High tritium concentrations are found in certain deep water masses, indicating an input of surface water into these masses in the last 10 to 20 years. The most rapid exchange of surface water with the deep ocean layers occurs at high northern and southern latitudes wherever strong overturn exists. (Knapp-USGS)
W74-05993

THE RESIDENCE TIME OF THORIUM IN SURFACE SEA WATER AND ITS IMPLICATIONS REGARDING THE RATE OF REACTIVE POLLUTANTS,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
W. S. Broecker, A. Kaufman, and R. M. Trier.
Earth and Planetary Science Letters, Vol 20, No 1, p 35-44, September 1973. 8 fig, 1 tab, 18 ref. AEC Contracts AT (30-1)3139 and AT (11-1) 3180.

Descriptors: *Tracers, *Path of pollutants, *Sea water, *Radium radioisotopes, Biodegradation, Nutrients, Plant growth.
Identifiers: *Thorium.

The activity ratio of Th-228 to Ra-228 in the open ocean averages 0.21. This suggests that thorium is removed from surface water in about 0.7 yr. As plant matter is cycled within the surface sea on a similar time scale, highly reactive compounds may be removed by plants in their use of nitrate and phosphate. Combined with the coefficient for horizontal eddy diffusivity obtained from the distribution of Ra-228 in surface sea water this result provides a basis for the prediction of the distribution of reactive pollutants released to the surface sea from coastal areas. (Knapp-USGS)
W74-05995

TRACE METALS IN THE NORTH SEA,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5A.
W74-06011

TRACE METALS IN SEDIMENTS OF NEW YORK BIGHT,
Westchester Community Coll., Valhalla, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-06012

SYSTEM SIMULATION TO IDENTIFY ENVIRONMENTAL RESEARCH NEEDS: MERCURY CONTAMINATION,
Bryn Mawr Coll., Pa. Dept. of Chemistry.
A. A. Anderson, J. M. Anderson, and L. E. Mayer.
OIKOS, Vol 24, No 2, p 231-238, 1973. 8 fig, 2 tab, 28 ref.

Descriptors: *Model studies, *Mercury, *Path of pollutants, *Environmental effects, Water pollution effects, Soils, Fish, Mud, Air, Air pollution, Heavy metals, Cycles.
Identifiers: *Data interpretation.

Data on the distribution and translocation of mercury in the environment are summarized to determine whether the mercury balance has been disturbed by man's activities and whether additional research is required. A model based on System Dynamics methodology was developed to identify research needs, assess the persistence of mercury as a pollutant, and analyze policies for controlling mercury pollution. This model traces the path of mercury from its natural sources to its natural sinks. By superimposing the effect of man's activities on the natural flow of mercury, the effect of industrial and agricultural consumption on mercury contamination in the world system can be examined. Although the model is not complete several conclusions result from the available data: Mercury pollution of soils and streams is primarily a local problem; mercury levels in marine fish may rise above acceptable levels if the consumption of resources with one ppm mercury or more continues. Further experimental research is needed to obtain data on the

mercury content of fossil fuels, on possible natural mechanisms for the release of mercury into the air, and on conversion mechanisms for methylation of mercury in the soil, ocean, and fish sectors. (Little-Battelle)
W74-06014

RELATIONSHIPS BETWEEN LEVELS OF RADIOCESIUM IN DOMINANT PLANTS AND ARTHROPODS IN A CONTAMINATED STREAMBED COMMUNITY,
Savannah River Ecology Lab., Aiken, S.C.
For primary bibliographic entry see Field 5C.
W74-06016

NITROGEN AND PHOSPHORUS RELEASE FROM DECAYING WATER MILFOIL,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W74-06018

POLLUTION OF THE NORTH SEA,
Deutsches Hydrographisches Institut, Hamburg (West Germany).
G. Weichart.
AMBIO, Vol 11, No 4, p 99-106, 1973. 5 fig, 4 tab, 17 ref.

Descriptors: *Water quality, *Industrial wastes, Sewage sludge, *Domestic wastes, *Reviews, *Sewage disposal, Water pollution sources, Water pollution effects, Ships, Heavy metals, Pesticides, Phosphates, Nitrates, Nitrites, Ammonia, Polychlorinated biphenyls, Phenols, Oil, Organic acids, Fly ash, Enzymes, Resins, Plastics, Wood wastes.
Identifiers: *North Sea, Mineral oil, Titanium dioxide, Synthetic fibers.

A literature review indicates that pollutants in the North Sea, which serves as a catchment area for part of Britain, Belgium, Holland, Luxemburg, most of Germany, and parts of Switzerland, Czechoslovakia, Denmark, and Norway are introduced by rivers, direct dumping from the coast, ship dumping, fallout, shipping, and offshore oil production. Pollutants identified are salts from potash mines, Phosphates from urban sewage, heavy metals (cr, Mn, Fe, Ni, Cu, Zn, Cd, Hg, Pb, and As), pesticides, nitrates, ammonia, nitrites, PCBs, phenols, mineral oil, titanim dioxide wastes, ash, synthetic fiber waste, enzyme waste, resin waste, acids, sewage sludge, oil, wood and plastic packing material, bottles, kitchen waste, and ship wash water. Although limited data are available, it is concluded that the North Sea is one of the most polluted areas of the world. (Little-Battelle)
W74-06023

UPTAKE AND ACCUMULATION OF AN ORGANOCHLORINE INSECTICIDE (DIELDRIN) BY AN ESTUARINE MOLLUSC, RANGIA CUNEATA,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-06031

METHYL MERCURY ACCUMULATION IN AN AQUATIC FOOD CHAIN. A MODEL AND SOME IMPLICATIONS FOR RESEARCH PLANNING,
Swedish Water and Air Pollution Research Lab., Stockholm.
T. Fagerstrom, and B. Asell.
AMBIO, Vol 2, No 5, p 164-171, 1973. 4 fig, 1 tab, 19 ref.

Descriptors: *Mercury, *Food chains, *Mathematical models, Industrial wastes, Water pollution effects, Pikes, Diptera, Ecosystems, Absorption, Respiration, Metabolism, *Path of pollutants, Heavy metals, Equations.
Identifiers: *Methylmercury, Roach, Biological magnification, Bioaccumulation.

A mathematical model was utilized to study the mechanisms of methyl mercury accumulation in aquatic food chains. The three step food-chain model has pike feeding on roach and roach feeding on chironomids. Functions in the model include environmental variables and equations describing some ecological and ethological processes that determine the flow of energy. The discussion is limited to three specific problems. (1) Is the model at all able to mimic, in a qualitative sense, the static picture that is common in nature, ie MM concentrations in fish increasing with age, and concentrations in predatory species exceeding those in prey species by a factor of two-five. (2) What is the relative importance of the accuracy of the numerical values for the calculated MM concentrations in the fish. (3) What are the dynamics of the reaction of the system to perturbations in the same simulations as were used for the sensitivity analysis. (Mortland-Battelle)
W74-06042

POLLUTION STUDIES IN THE CLYDE SEA AREA,
Marine Lab., Aberdeen (Scotland).
For primary bibliographic entry see Field 5C.
W74-06049

TRACE METALS IN CARBONATE AND ORGANIC RICH SEDIMENTS,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
For primary bibliographic entry see Field 5A.
W74-06050

ACCUMULATION AND MOVEMENT OF MIREX IN SELECTED ESTUARIES OF SOUTH CAROLINA, 1969-71,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab.
P. W. Borthwick, T. W. Duke, A. J. Wilson, Jr., J. I. Lowe, and J. M. Patrick, Jr.
Pesticides Monitoring Journal, Vol 7, No 1, p 6-26, June 1973. 1 fig, 14 tab, 9 ref.

Descriptors: Pesticide kinetics, *Pesticide residues, *Bottom sediments, *Estuaries, *Path of pollutants, Biota, Chlorinated hydrocarbon pesticides, Fish, Water birds, Shellfish, Bird eggs, Mammals, Insecticides, Shrimp, Crabs, Estuarine environment, Water sampling, Bottom sampling, Trawling, Crustaceans, Shrimp, Atlantic menhaden, Marine animals, Statistical methods, Mortality, *South Carolina, Water pollution.
Identifiers: *Mirex, Bioaccumulation, Animal tissues, Data interpretation, Chemical recovery, Sample preparation, Biological magnification, Electron capture gas chromatography, Finfish, Sampling frequency, Muscle, Log Bridge Creek, Old Town Creek, Beresford Creek, Alligator Creek, Toogoodoo Creek, Riverland Terrace Pond, Stono River, Ashley River, Cooper River, Wando River, South Santee River, Blue crab, Common mud crab, Mud crab, Portunid crab, Sand fiddler crab, Brown shrimp, Brown-spotted shrimp, Grass shrimp.

In conjunction with a fire ant eradication program during which mirex was aerially applied to coastal areas near Charleston, S.C., field studies were conducted to Monitor the movement and accumulation of mirex in the estuarine system. Collections of background and periodic posttreatment samples of water, bottom sediments, shrimp, crabs, fish, and estuary-dependent birds and mammals were analyzed for mirex using electron-capture gas chromatography. The data revealed that (1) mirex was translocated from treated lands and high marsh to estuarine biota - all animal classes sampled contained mirex; and (2) biological concentration of mirex occurred - especially in predators such as racoons and birds. Mirex residue ranges for respective sample categories were: water (less than 10.01 ppb); sediment (0-0.07 ppm); crabs (0-0.60 ppm); fishes (0-0.82 ppm); shrimps (0-1.[illegible] ppm); mammals (0-4.4 ppm); and birds (0-17.[illegible] ppm)). No mass mortalities were observed during the study. (Holoman-Battelle)
W74-06054

DIVERSITY IN FRESH-WATER PHYTOPLANKTON,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
For primary bibliographic entry see Field 5C.
W74-06057

FACTORS AFFECTING THE BEHAVIOR OF FIVE CHLORINATED HYDROCARBONS IN TWO NATURAL WATERS AND THEIR SEDIMENTS,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
P. C. Oloffs, L. J. Albright, S. Y. Szeto, and J. Lau.
Journal of the Fisheries Research Board of Canada, Vol 30, No 11, p 1619-1623, November 1973. 3 tab, 5 ref.

Descriptors: *Bottom sediments, *Pesticide kinetics, *Environmental effects, Water pollution, Chlorinated hydrocarbon pesticides, *Path of pollutants, Laboratory tests, DDT, DDD, Pesticide residues, Polychlorinated biphenyls, *Canada.
Identifiers: Fraser River(B.C.), Georgia Strait(B.C.), *Chlorinated hydrocarbons, Natural waters, Chemical recovery, alpha-Chlordane, gamma-Chlordane, Agitation.

Water samples from the Fraser River and Georgia Strait, British Columbia, were treated with different chlorinated hydrocarbons and incubated for up to 12 weeks at 13C. (1) In the presence of bottom sediments from the same locations as the waters, no residues were found to escape into the atmosphere. (2) With the exception of lindane in ocean water, all detectable residues had moved into the sediments after 6 weeks. (3) Most of the lindane was metabolized. (4) Sterlilization of the waters and sediments prevented the metabolism of lindane but had little effect on DDT and DDD. (5) Agitation of water samples containing gammg-chlordane, incubated without sediment, had no effect on its disappearance, but the presence of 0.01 percent of a nonionic surfactant retarded this almost completely. (Holoman-Battelle)
W74-06064

ATTACHMENT OF BACTERIA TO SULPHUR IN EXTREME ENVIRONMENTS,
Indiana Univ., Bloomington. Dept. of Microbiology.
R. L. Weiss.
Journal of General Microbiology, Vol 77, No 2, p 501-507, August 1973. 4 fig, 10 ref.

Descriptors: *Sulphur bacteria, *Hot springs, *Adhesion, Hydrogen ion concentration, Cultures, Incubation, Sediments, Electron microscopy, Sulfur, Water temperature, Sampling.
Identifiers: Sulfolobus, Pili, Media, Yellowstone National Park.

Sulfolobus attaches to sulphur deposited in acid hot springs by means of pili characterized as follows: (1) generally irregular shape with slight curves and bends: (2) adhesiveness that enables bacteria to attach to sulphur; (3) acid-stable, resistant to pH values as low as 2; (4) heat-stable, resistant to temperatures as high at 75C. Sulfolobus attached to sulphur in nature and in culture eroded the sulphur crystal where the bacteria were attached. Sulfolobus undergoes the following two forms of attachment: (1) to sulphur by pili which separate the bacterium from the sulphur crystal and permit lateral movement of bacteria; (2) to glass slides by firm adhesion of the wall to the sur-

face of slide. Attachment to sulphur in flowing springs enables Sulfolobus to colonize these low pH (2 to 3) high temperature (70 to 75C) habitats. (Mortland-Battelle)
W74-06065

METABOLISM OF SELECTED PESTICIDES BY MARINE MICROORGANISMS,
Syracuse Univ. Research Corp., N.Y. Life Sciences Div.
For primary bibliographic entry see Field 5C.
W74-06066

THE DISTRIBUTION OF HEAVY METALS IN REEF-DWELLING GROUPERS IN THE GULF OF MEXICO AND BAHAMA ISLANDS,
Texas A and M Univ. College Station. Dept. of Oceanography.
D. D. Taylor, and T. J. Bright.
Available from the National Technical Information Service as COM-73-11311; $6.25 in paper copy, $1.45 in microfiche. Report No. TAMU-SG-73-208, May 1973. 267 p, 17 fig, 62 tab, 218 ref. Contract No. 043-158-18.

Descriptors: *Gulf of Mexico, *Distribution patterns, *Heavy metals, Reefs, Mercury, Cadmium, Lead, Copper, Zinc, Growth rates, Animal metabolism, Habitats, Reproduction, Food habits, Trophic levels, Animal growth, Water pollution effects, Phosphates, Sea water, Oceans, Sampling, Spectrophotometry, Colorimetry, Sediment transport, Depth, Water temperatures, Salinity, Marine fish, Pollutant identification, Sea basses.
Identifiers: *Bahama Islands, *Groupers, Animal tissues, Bioaccumulation, Epinephelus striatus, Mycteroperca, Muscle, Liver, Sample preservation, Otoliths, Flameless atomic absorption.

Grouper species of the Epinephelus complex (Family Serranidae) from reefs or reef banks in the Gulf of Mexico and Caribbean Sea were analyzed for heavy metals (Hg, As, Cd, Pb, Cu, Zn). Almost all showed levels below those generally deemed dangerous to humans. Geographical variations for mercury were detected, but must be viewed in light of regional differences in trophic structure and various other factors. Correlation between concentrations of heavy metals and growth factors (age, weight, standard length) indicated differences between members of the same species as well as interspecific differences. Mercury and zinc appear to increase with age and size in certain groupers, whereas arsenic shows absolutely no correlation. Interspecific differences, particularly in the accumulation of mercury and arsenic, were demonstrated between Epinephelus striatus and the three species, Mycteroperca tigris, M. phenax, and E. cruentatus. These differences reflect possible variations in feeding habits and metabolism. Therefore, extrapolation of data from one species to another is invalid, as if lumping species to represent a trophic level. High levels of arsenic in reef organisms appear to be related to the substitution of arsenate for phosphate in biological systems. A hypothesis is proposed whereby low phosphate reef waters result in accumulation of arsenic by reef organisms, implying a natural mechanism rather than a pollution problem. Subtle biogeochemical cycles like this one caution against the use of a heavy metal content as a direct index to pollution levels. (Mortland-Battelle)
W74-06071

HYDROCARBON-OXIDIZING BACTERIA AND THEIR POSSIBLE USE AS CONTROLLING AGENTS OF OIL POLLUTION IN THE OCEAN,
Naval Weapons Center, China Lake, Calif. Research Dept.
G. Soli.
Available from the National Technical Information Service as AD763-655 $3.00 in paper copy, $1.45 in microfiche. Technical Report No. 3, July 1973. 11 p, 3 tab, 7 ref.

Descriptors: *Microbial degradation, *Oil spills, *Marine microorganisms, *Water pollution control, Marine bacteria, Biodegradation, Oceans.
Identifiers: *Hydrocarbon-oxidizing bacteria, *Substrate utilization, Heterotrophic bacteria, Aromatic hydrocarbons, Aliphatic hydrocarbons, Synthetic oil, n-Paraffins, Isoparaffins, Cycloparaffins, Bacterial physiology, Farnesane, Pristane, Phytane, Squalene, Decalin, Bicyclohexyl, Heptycyclohexane, Marine environment.

Attempts were made at characterizing marine bacterial isolates on the basis of their ability to attack hydrocarbons in a complex synthetic mixture. By balancing properly the various components, it is possible to outline the oil degradation range of the organisms. By using different nitrogen sources, both organic and inorganic, it is also possible to determine indirectly the degree of specialization and adaptation to hydrocarbon oxidation. A broad classification of hydrocarbonoclastic bacteria is discussed, and routes of attack of the various types of hydrocarbons are examined. (Holoman-Battelle)
W74-06075

BIODEGRADATION OF OIL,
Houston Research, Inc., Tex.
S. J. Sedita.
Available from the National Technical Information Service as AD-763 467 $3.00 in paper copy, $1.45 in microfiche. Final Report, June 30, 1973. 48 p, 5 fig, 10 tab, 11 ref. Contract No. N00014-72-C-0471.

Descriptors: *Oil wastes, *Microbial degradation, *Biodegradation, Organic matter, Sea water, Water pollution control, Oil pollution, Marine bacteria, Laboratory tests, Cultures, Nutreients, Nitrogen, Pseudomonas, Carbon, Oxidation.
Identifiers: Bunker C oil, *Hydrocarbon-oxidizing bacteria, Substrate utilization, Fuel oil, Motor oil, Fate of pollutants, Culture media, Gaffkya tetragena, Micrococcus lysodeikticus, Mycobacterium smegmatis, Proteus vulgaris, Pseudomonas aeruginosa, Corynebacterium spp, Bacillus, Arthrobacter, Streptomyces, Flavobacterium, Achromobacter, Alcaligenes, Sonication, Silica gel chromatography.

This study was carried out to determine the feasibility of using partially disrupted microorganisms in conjunction with intact cells to accelerate the oxidative degradation of hydrocarbons. Initially, 40 plus organisms were isolated which were capable of degrading some fraction of Bunker 'C' residual fuel oil. These organisms spanned the spectrum of genera from Micrococci to Streptomyces. Those organisms capable of degrading various hydrocarbon fractions were isolated not only from the oil rich sources, but from university culture collections. Various 'recipes' of organisms were tested under laboratory and large scale conditions to determine their effectiveness in degrading Bunker 'C' residual fuel oil. Several conclusions were reached: Isolation of microorganisms capable of degrading hydrocarbons may be accomplished with relative ease. Many genera are capable of degrading at least one of the major fractions of Bunker 'C' residual oil. Laboratory evaluation of hydrocarbon oxidation should be based on more than one parameter, including disappearance or change of substrate. Although individual organisms were capable of degrading Bunker 'C' residual, a recipe of organisms had less removal capacity in the laboratory and in large tanks. Made to order recipes of organisms, based on their individual capabilities may not be the best approach to large scale removal of Bunker 'C'. More work on the generic and specific composition of artificial mixtures of microorganisms in this context is required. Mixtures formulations should be restricted to as few organisms as possible, and obviously to those which exhibit no inhibitory effects on other organisms. (Mortland-Battelle)
W74-06076

ENRICHING EFFECTS OF URBAN RUNOFF ON THE PRODUCTIVITY OF A MESOTROPHIC LAKE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W74-06080

SOME CHARACTERISTICS OF AN OSCILLATORIA-DOMINATED METALIMNETIC PHYTOPLANKTON COMMUNITY,
Allegheny Coll., Meadville, Pa. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-06081

THE HETEROTROPHIC CAPABILITIES OF CYCLOTELLA MENEGHINIANA,
Hartford Univ., Conn. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-06090

A PRELIMINARY NOTE ON THE SEQUENTIAL DECOMPOSITION OF PECTIN BY AQUATIC BACTERIA,
Freiburg Univ. (West Germany). Limnologisches Institut.
H. Gude, and W. Reichardt.
Water Research, Vol 7, No 12, p 1881-1883, December 1973. 1 fig, 8 ref.

Descriptors: *Microbial degradation, *Aquatic bacteria, Biodegradation, Growth rates, Cultures, Enzymes, Organic compounds, Carbohydrates, *Eutrophication.
Identifiers: *Pectin, *Fate of pollutants, Flavobacterium, Cytophaga, Substrate utilization, Enzyme production, Heterotrophic bacteria, Culture media, *Germany(Mindel Lake).

In the eutrophic Mindel Lake near Constance, W. Germany, the total viable heterotrophic and aerobic bacteria on caseine-peptone-starch-agar (Collins and Willoughby, 1962) as well as their pectolytic portion were counted during the main periods of plankton vegetation and decomposition (from August till February). An inverse relationship was observed between total aerobic heterotrophic bacteria and their pectolytic share which consisted mainly of Flavobacterium-Cytophaga species. When grown in a medium containing pectin and yeast extract as organic compounds pure cultures of the most abundant type of this bacterial group showed a diauxic characteristic of growth. A short time before entering the first lag phase of growth, production of pectolytic enzymes increased until the end of the second log phase of growth. This phenomenon may be due to the mechanism of a catabolic repression and derepression. (Mortland-Battelle)
W74-06092

DEFECTS IN PRODIGIOSIN FORMATION BY L-FORMS OF SERRATIA MARCESCENS,
Veterans Administration Hospital-Wadsworth, Los Angeles, Calif. Research and Medical Service.
For primary bibliographic entry see Field 5A.
W74-06099

ELECTRON DONOR-ACCEPTOR REAGENTS IN THE ANALYSIS OF PESTICIDES. VII. A SIMPLE MODEL SYSTEM HYDROLYSIS OF SOME CARBAMATE PESTICIDES,
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
J. D. MacNeil, R. W. Frei, M. Frei-Hausler, and O. Hutzinger.
International Journal of Environmental Analytical Chemistry, Vol 2, No 4, p 323-330, 1973. 4 fig, 1 tab, 9 ref.

Descriptors: *Carbamate pesticides, *Degradation(Decomposition), *Chemical analysis, *Hydrolysis, Aqueous solutions, Persistence,

Hydrogen ion concentration, Pesticide kinetics, Stability, Insecticides, Herbicides, Chlorinated hydrocarbon pesticides, Pollutant identification, *Chromatography, *Spectroscopy.
Identifiers: Reflectance spectroscopy, Thin layer chromatography, Complexing reagents, Hydrolysis products, Carbaryl, Mobam, IPC, CIPC, 9-Dicanyomethylene-2 4 7-trinitrofluorene, Complexation, alpha-Naphthol.

The decomposition of the carbamate insecticides carbaryl and Mobam and the herbicides IPC and CIPC in water at various pH's was investigated. Analyses were preformed in situ on silica-gel thin-layer chromatograms by reflectance spectroscopy after the developed chromatograms had been sprayed with the regent CNTNF (9-dicyanomethylene-2,4,7-trinitrofluorene) to form visible pi-complexes of the pesticides. The experiments indicate that the N-methyl carbamate insecticides studied decompose fairly rapidly in water at alkaline pH's and that this process occurs more rapidly as the water becomes more basic. Reaction occurs more slowly at neutral pH and the compounds appear quite stable at acid pH. Similar behavior was observed with the major hydrolyzed products in basic media, but these appear to be more persistent than the parent pesticides. The N-phenyl carbamates studied appear to persist under both acidic and alkaline conditions. The results suggest that the persistence in water of the pesticides studied and also of their major products, as well as the many other related pesticides in common use, should be the subject of further investigation. (See also W74-05440) (Holoman-Battelle)
W74-06121

PHOTODECOMPOSITION OF CHLORINATED BIPHENYLS AND DIBENZOFURANS,
California Univ., Davis. Dept. of Environmental Toxicology.
D. G. Crosby, and K. W. Moilanen.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 6, p 373-377, December 1973. 1 fig, 1 tab, 33 ref.

Descriptors: *Polychlorinated biphenyls, *Gas chromatography, Irradiation, *Mass spectrometry, *Degradation(Decomposition), Pollutant identification, Spectrophotometry.
Identifiers: *Photodecomposition, Degradation products, *Chlorodibenzofurans, GC-Mass spectrometry, Fate of pollutants, Photolysis, 2 8-Dichlorodibenzofuran, 2-Chlorodibenzofuran, 2 5-Dichlorobiphenyl, 2 2' 5 5'-Tetrachlorobiphenyl.

Chlorinated biphenyls and dibenzofurans were irradiated in an aerated, sunlight-simulating, laboratory photoreactor and examined by gas chromatography and mass spectrometry to determine the possible degradative effects of the ultraviolet component of sunlight. Irradiation of chlorinated biphenyls dispersed in water follwed by GC/MS, revealed identifiable traces of 2-chlorodibenzofuran as a photolysis product of 2,5-dichloro- and 2,2',5,5'-tetrachlorobiphenyl in roughly a 0.2 percent steady-state yield. Similar irradiation of 2,8-dichlorodibenzofuran also resulted in slow dehalogenation, explaining the previous appearance of 2-chlorodibenzofuran. The photodecomposition of the lower chlorinated PCB isomers in both polar and nonpolar solvents reveals the operation of environmental mechanisms which could effectively degrade these widespread contaminants. (Holoman-Battelle)
W74-06125

PESTICIDES IN EFFLUENTS AND POLLUTED RIVER WATER,
Bradford Univ. (England). School of Biological Sciences.
For primary bibliographic entry see Field 5A.
W74-06130

OXIDATION-REDUCTION POTENTIAL AND GROWTH OF SALMONELLA AND PSEUDOMONAS FLUORESCENS,
Iowa State Univ., Ames. Dept. of Food Technology.
For primary bibliographic entry see Field 5C.
W74-06134

POSSIBLE MICROBIAL CONTRIBUTION TO NITROSAMINE FORMATION IN SEWAGE AND SOIL,
International Inst. of Tropical Agriculture, Ibadan (Nigeria).
A. Ayanaba, W. Verstraete, and M. Alexander.
J Natl Cancer Inst. Vol 50, No 3, p 811-813, 1973.
Identifiers: Fungicides, *Methylamines, *Microbial activity, Microorganisms, *Nitrosamines, *Sewage, Soils, *Thiram, Metabolism.

Microorganisms in sewage converted trimethylamine to dimethylamine (DMA) and also produced dimethylnitrosamine. DMA formation was solely the result of microbial activity. Most of the nitrosamine generated from added DMA and nitrite at neutral pH was a consequence of microbial metabolism. The nitrosamine also formed in acid soil from DMA and in acid sewage from the fungicide thiram. Although nitrosamines have not yet been found, or actively sought, in unamended sewage or soil, these findings indicate a potential for their formation in such environments.--Copyright 1973, Biological Abstracts, Inc.
W74-06136

THE POSSIBLE OCCURRENCE OF PHOTOSYNTHETIC MICROORGANISMS IN DEEP-SEA SEDIMENTS OF THE NORTH ATLANTIC,
City Coll., New York.
T. C. Malone, C. Garside, R. Anderson, and O. A. Roels.
Journal of Phycology, Vol 9, No 4, p 482-488, December 1973. 1 fig, 3 tab, 31 ref.

Descriptors: *Diatoms, *Marine microorganisms, *Bottom sediments, *Atlantic Ocean, *Deep water, Plant pigments, Photosynthesis, Plant growth, Bottom sampling, Water analysis, Chemical analysis, Soil analysis, Nitrates, Ammonia, Phosphates, Silicates, Silicon, Growth rates, Marine algae.
Identifiers: Growth kinetics, Cell density, Amphora, Nitzschia, Navicula, Fragilaria, Chlorophyll a, Sample preservation, Red clay.

An assemblage of 12 diatom species and other photosynthetic microorganisms associated with red clay sediments collected from a depth of 6150 m in the North Atlantic was observed to bloom in Antarctic bottom water when exposed to sunlight at sea surface temperature. Although no growth could be detected over the first 3 days of the experiment, nitrate was nearly completely stripped from the water. The maximum growth rate of 4.7 doublings/day was reached between days 1 and 5. Most of the diatom species have been described as littoral or coastal forms, and it is suggested that these organisms are transported to depth by fecal material, turbidity currents, or a combination of the two. (Holoman-Battelle)
W74-06155

MUSSELS AND INDICATORS OF BIOLOGICAL RECOVERY ZONE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-06158

NUTRIENT-PRODUCTIVITY RELATIONSHIPS IN A BAYOU ESTUARY,
General Electric Co., Bay Saint Louis, Miss. Mississippi Test Support Dept.
For primary bibliographic entry see Field 5C.
W74-06160

PROPERTIES OF GB IN WATER,
Edgewood Arsenal, Aberdeen Proving Ground, Md.
J. Epstein.
Journal American Water Works Association, Vol 66, No 1, p 31-37, January 1974. 5 fig, 5 tab, 28 ref.

Descriptors: *Pollutant identification, Methodology, *Physical properties, *Chemical analysis, *Water treatment, Water pollution effects, *Water pollution, Hydrolysis, Bioassay, Toxicity, Solubility, Environmental effects, Water temperature, Hydrogen ion concentration, Chemical reactions, Toxins, Pollutants, Lethal limit, Trace elements, Heavy metals, Catalysts, Cations, Manganese, Copper, Magnesium, Density, Volatility, Vapor pressure, Water analysis, Activated carbon, Fish, Testing procedures.
Identifiers: *Nerve gas GB(Sarin), Half-life, Pollutant removal, Hydrolysis products, Median tolerance limit, Green sunfish, Fathead minnow, Goldfish, Enzymatic techniques, Isopropyl methylphosphonic acid, Hydrofluoric acid.

The purpose is to determine what practical measures can be taken to detect and minimize the effects of nerve gas contamination, specifically that of GB, should there be a need for such measures. GB or Sarin is liquid at room temperature, very soluble with rapid dissolution in water, and extremely toxic when inhaled or absorbed through the skin. Experiments on rats and rabbits have shown that this agent is not readily absorbed through the skin from aqueous solutions. Hydrolysis of GB in water yields isopropyl methylphosphonic acid and hydrofluric acid. The rate of hydrolysis is accelerated by both acids and bases, with the latter more effective. At 25C between pH values of 0 and 4, the hydrolysis is speeded by hydronium-ion catalysis; between pH 6.5 and 14, the hydrolysis is mediated by hydroxide-ion attack. In the intermediate pH range of 4-6.5, where the hydrolysis rate is at a minimum, the reaction is between GB and water molecules. The rate of hydrolysis of GB is markedly affected by the presence of some cations. Even trace amounts, in some cases, are sufficient to lower the half-life by two orders of magnitude. Since the rate of decomposition of GB is equal to the product of the bimolecular rate constant and the concentration of the hydroxocation, Cu and Mn will be more effective catalysts than Mg for the hydrolysis of GB. Those enzymatic, chemical, and bioassay procedures for the detection and analysis of GB in water are presented as well as treatment procedures for removing or destroying GB. (Holoman-Battelle)
W74-06161

OYSTERS: RETENTION AND EXCRETION OF THREE TYPES OF HUMAN WATERBORNE DISEASE BACTERIA,
Army Medical Research Inst. of Infectious Diseases, Frederick, Md.
For primary bibliographic entry see Field 5C.
W74-06167

BIOLOGICAL EFFECTS OF FENITROTHION IN THE DIET OF BROOK TROUT,
Fisheries Research Board of Canada, St. Andrews (New Brunswick), Biological Station.
For primary bibliographic entry see Field 5C.
W74-06169

THE FATE OF DIELDRIN IN A MODEL ECOSYSTEM,
Illinois State Natural History Survey, Urbana.
J. R. Sanborn, and Y. Ching-Chieh.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 6, p 340-346, December 1973. 6 tab, 2 ref.

Descriptors: *Dieldrin, *Ecosystmes, Persistence, Model studies, *Path of pollutants, *Biodegradation, *Pesticides residues, Radioactivity techniques, Metabolism, Stability, Absorption, Crabs, Clams, Daphnia, Separation techniques, Degradation(Decomposition), Algae, Mosquitoes, Snails, Pesticide kinetics.
Identifiers: *Fate of pollutants, Metabolites, Biological samples, Bioaccumulation, Acetone, Liquid scintillation, Scintillation counting, Degradation products.

A model ecosystem containing algae, clams, crabs, Daphnia, Elodea, mosquitoes, fish and snails was used to examine the persistence of dieldrin. Replicate systems were used with 7.905 mg C-14-labeled dieldrin as an acetone solution (0.5 ml) applied to sorghum leaves in each. Study of accumulation, metabilism, and degradation of the dieldrin continued for 34 days. The organisms were extracted with acetone and solubilized with Protosol for liquid scintillation counting. The examination of dieldrin in this model ecosystem clearly demonstrates the stability of this insecticide towards either biological or chemical modification by the elements of this system. The demonstration that approximately 97 percent of the extracted radioactivity in the organisms was dieldrin emphasizes the inertness of dieldrin to metabolism or degradation to polar, nonlipid partitioning materials by the components of this model ecosystem. If information about the stability and persistence of pesticides derived from this system can be related to a real environmental situation, and it definitely seems to be in the case of DDT, then the data of this paper indicate that dieldrin like DDT, might be considered, because of its extreme stability, an undesirable pesticide for widespread generalized use in agricultural and public health entomology. (Mortland-Battelle)
W74-06170

MOBILIZATION OF SOME METALS IN WATER AND ANIMAL TISSUE BY NTA, EDTA AND TPP,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. Barica, M. P. Stainton, and A. L. Hamilton.
Water Research, Vol. 7, No. 12, p 1791-1804, December 1973. 6 fig, 5 tab, 21 ref.

Descriptors: *Path of pollutants, *Alkaline earth metals, *Alkali metals, *Heavy metals, *Nitrilotriacetic acid, Crayfish, Midges, Rainbow trout, Bottom sediments, Detergents, Movement, Kinetics, Cations, Calcium, Magnesium, Sodium, Potassium, Iron, Manganese, Zinc, Copper, Lead, Chromium, Absorption, Lake sediments, Chemical analysis, Water analysis, Gas chromatography, Bioassay.
Identifiers: *Chelating agents, Animal tissues, Mobilization, *Ethylenediaminetetraacetic acid, Chironomids, Detergent builders, *Sodium tripolyphosphate, Flameless atomic absorption spectrophotometry, Metal chelates, Guppy, Chironomids, Detergent builders, Sample preparation, Emission spectroscopy, Atomic absorption spectrophotometry, Orchard leaves, Clay Lake.

Parallel experiments were conducted under stagnant and flowing conditions to determine whether sodium tripolyphosphate (TPP), the conventional detergent builder, or two potential replacements, nitrilotriacetic acid (NTA) and ethylenediaminetetraacetic acid (EDTA) significantly influenced the mobilization of major cations (Ca, Mg, Na, K) and some heavy metals (Fe, Mn, Zn, Cu, Pb, Cr). Water, sediments and tissues of chironomid adults (Chironomus tentans Fabricius), crayfish (Orconectes virilis Hagen) and rainbow trout (Salmo gairdneri Richardson) were examined. The results showed that the chelating agents applied in concentrations of 0.2-5.0 mg/l often increased the concentration of iron, manganese, lead and zinc in water above contaminated lake sediments. Other heavy metals were not affected significantly. EDTA was the most active mobilizing agent while NTA and TPP both had a less significant effect. The chelating agents generally had little effect on the rate of uptake of most metals by chironomids in aquaria. The role of chelating agents in flowing systems was even less pronounced. Zinc concentrations in water were significantly elevated by the treatment with 1 mg/l EDTA and manganese concentrations were significantly higher in trout from the pond treated with an intermediate level (1 mg/l) of NTA. All other treatments yielded levels of major ions and heavy metals that were not significantly different from those in the control ponds. (Holoman-Battelle)
W74-06173

THE SEARCH FOR TOMORROW'S POWER,
For primary bibliographic entry see Field 5G.
W74-06198

ALLUVIAL GROUND WATER QUALITY ALTERATION AS RELATED TO SOLID WASTE DISPOSAL SITES IN IOWA, PART I: TEXT; PART II: APPENDIX,
Iowa State Univ., Ames. Dept. of Earth Sciences.
J. M. Peckenpaugh.
Available from the National Technical Information Service as PB-230 795 $25.75 in paper copy, $1.45 in microfiche. M Sc Thesis, 1973. 440 p, 58 fig, 29 tab, 47 ref, 5 append. OWRR A-047-IA (2).

Descriptors: *Path of pollutants, *Landfills, *Iowa, Garbage dumps, Water pollution sources, Municipal wastes, Seepage, *Waste disposal, Waste water disposal, *Solid wastes.

The effects solid waste disposal sites in and near Iowa located on alluvial systems have upon groundwater quality were studied at Ames, Des Moines, Mason City, and Omaha. The hydrogeologic study was pursued to satisfy four major objectives. The first was to determine the composition and variations in the composition of groundwater affected by leachate flowing from solid waste disposal sites. The second objective was to determine the shape of the contaminated zone of groundwater and the approximate direction and rate of groundwater flow in the vicinity of the landfills. A third objective was to evaluate the effects that precipitation and variations in stream discharge had upon the static water level, the composition of the groundwater, and groundwater movement in the vicinity in the landfills. The fourth was the development of general cases that could be applied to similar hydrogeologic environments. (Knapp-USGS)
W74-06256

PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF CONEWAGO LAKE DRAINAGE BASIN, YORK COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 5C.
W74-06259

WATER QUALITY REPORT--YAKIMA RIVER, DECEMBER 1970--SEPTEMBER 1971,
Washington State Dept. of Ecology, Olympia.
D. M. McGaughy, and R. K. Cunningham.
Technical Report No 73-002, May 1973. 87 p, 8 fig, 43 tab, 12 ref.

Descriptors: *Water quality, Rivers, *Washington, Monitoring, Sampling, *Coliforms, Nitrates, Water temperature, Sodium, Calcium, Return flow, Farm wastes, Water pollution sources, *Dissolved oxygen.
Identifiers: *Yakima River(Wash).

Data collected through the winter months reveal distinct pollution problems in the Yakima River, Washington. The most significant effect of pollution was the river's bacterial condition. Nutrients were high enough at many stations to support algal blooms under optimal growth conditions. The summer months held the most serious pollution problems for the year, revealing amplifications of problems observed in the previous quarters. All coliform values were in violation of both conditions of the water quality standard. Eight out of eleven stations surpassed the maximum temperature limit. Also, there appeared to be a dissolved oxygen sag between Yakima and Granger and between Prosser and Kiona. This dissolved oxygen reduction seems to be directly related to the oxidation of organic material and not increased temperature. Extremely high nitrate values existed at the principal areas of irrigation return water. At Terrace Heights, above the influence of irrigation, 81% of the cations were calcium and magnesium while downstream at Kiona only 57% of the cations were calcium and magnesium. This change was probably related to substantial amounts of sodium being washed from the soil as a result of agricultural activities. The water quality has remained virtually unchanged during the summer over the past 4 years. (Knapp-USGS)
W74-06261

EFFECTS OF WELL INJECTION ON A BASALTIC GHYBEN-HERZBERG AQUIFER,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
D. R. Hargis, and F. L. Peterson.
Ground water, Vol 12, No 1, p 4-9, January-February 1974. 7 fig, 4 ref. OWRR A-028-HI (2).

Descriptors: *Artificial recharge, *Injection wells, *Waste disposal wells, Basalts, *Hawaii, Groundwater movement, Storm runoff, Urban runoff, Aquifer testing.
Identifiers: Ghyben-Herzberg aquifers.

The practice of artificially recharging wastewater such as storm runoff, sewage effluent, and various industrial wastes into the subsurface is of growing importance in Hawaii. In 1970 construction of a collection basin and four deep injection wells for the disposal of storm runoff from a residential development began in Kahului, Maui. This presented an opportunity to evaluate the response of a basaltic Ghyben-Herzberg aquifer to well injection, and to measure the rate of movement of injected water in the aquifer. The results of pumping and injection tests of one completed well and one test hole indicate that the finished injection wells should be able to transmit sediment-free water at rates in excess of 5,500 gallons per minute per well. Observation well measurements indicate that injected water moves at a gross velocity of one foot per minute in the basalt aquifer in the vicinity of the injection wells. (Knapp-USGS)
W74-06264

NITRATE-NITROGEN AND PHOSPHORUS CONTENTS OF STREAMS DRAINING SMALL AGRICULTURAL WATERSHEDS IN KENTUCKY,
Kentucky Univ., Lexington. Dept. of Agronomy.
G. W. Thomas, and J. D. Crutchfield.
Journal of Environmental Quality, Vol 3, No 1, p 46-49, January-March 1974. 5 fig, 2 tab, 3 ref. OWRR A-024-KY (2).

Descriptors: *Nitrates, *Phosphorus, *Small watersheds, *Kentucky, *Land use, Fertilizers, Hydrogeology, Water pollution sources.

Eight streams draining agricultural watersheds representative of the important physiographic regions of Kentucky were sampled monthly from January through May in both 1971 and 1972. The objective was to determine the effects of land use and geology on the concentrations of nitrate-N and P in the stream water. The land use ranged from almost completely forested to mostly cultivated. There was no good relationship between nitrate-N and land use. Nitrate-N varied from 6 ppm to zero, with the highest value found in a stream draining a

watershed which was 98% in bluegrass pasture. The P concentrations in the stream water were closely related to local geology and not to land use. A comparison between the 1921 data and 1971-72 data from the same geological areas showed very little change in mean nitrate-N or P concentrations. (Knapp-USGS)
W74-06265

LOSS OF MERCURY(II) FROM SOLUTION,
Kansas State Univ., Manhattan. Dept. of Agronomy.
D. W. Newton, and R. Ellis, Jr.
Journal of Environmental Quality, Vol 3, No 1, p 20-23, January-March 1974. 6 tab, 14 ref. OWRR B-027-KANS (1).

Descriptors: *Mercury, *Water analysis, *Chemical analysis, Tracers, Aqueous solutions, Clay minerals, *Ion exchange, Oxidation, Reduction(Chemical), Chemical reactions.

Loss of mercury(II) from dilute solutions was studied using Hg-203 as a tracer. Magnitude and rate of loss depend on Hg(II) concentration, chemical composition of carrier solutions, and container material. Losses were severe only at Hg(II) concentrations of 0.2 ppm or lower. Of the Hg-containing solutions studied, loss was greatest from 0.01M CaC12; Hg(II) was stable at all levels in concentrated HN03. Increasing pH from 4 to 8 reduced Hg loss. Adding KMn04 also reduced losses. Glass and plastic containers differ in their ability to retain Hg(II) in solution. The problem of Hg loss has serious implications in analyses of Hg as an environmental contaminant and in research where low concentrations of Hg are used. (Knapp-USGS)
W74-06266

APPRAISAL OF THE QUALITY OF GROUND WATER IN THE HELENA VALLEY, MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 2F.
W74-06269

DISTRIBUTION OF RADIONUCLIDES IN THE COLUMBIA RIVER STREAMBED FROM THE NUCLEAR REACTORS, HANFORD RESERVATION TO LONGVIEW, WASHINGTON,
Geological Survey, Portland, Oreg.
W. L. Haushild, G. R. Dempster, Jr., and H. H. Stevens, Jr.
Open-file report, 1973. 73 p, 12 fig, 11 tab, 21 ref.

Descriptors: *Path of pollutants, *Water pollution sources, *Columbia River, *Radioactive wastes, Bottom sediments, Estuaries, Alluvial channels, Radioisotopes, Cooling water, Zinc, Chromium, Cobalt radioisotopes, Manganese.
Identifiers: Antimony, Scandium, Zirconium, Niobium, Ruthenium.

Until all the eight nuclear reactors that were cooled by once-through flow of water were shut down in 1971, their effluents were the main source of dissolved and particulate radionuclides in the Columbia River. The pattern of seasonal variation of radionuclide concentrations in surficial sediment of the Columbia River generally was independent of location, radionuclide species, and sediment composition. The variations were attributable to seasonal changes in concentrations of suspended-particulate and dissolved radionuclides at Pasco, Wash., and changes in hydrodynamic and sediment-transport characteristics of the river. Radionuclide concentrations were maximum during November-early January and late March-early May, and were minimum during June-July and late January-early March. The estimated mean amount of five radionuclides accumulated in the bed from the reactors, Hanford Reservation to Longview, Wash., in 1965, was 37,100 curies and consisted of 12,800 curies of zinc-65, 22,300 curies of chromium-51 and 2,000 curies of three radionuclides, which were cobalt-60, scandium-46, and manganese-54. The main source of particulate radionuclides discharged to the ocean during high-water discharges in June was the riverbed rather than the estuary bed. (Knapp-USGS)
W74-06272

WATER QUALITY REPORT--STILLAGUAMISH RIVER, DECEMBER 1970-SEPTEMBER 1971,
Washington State Dept. of Ecology, Olympia. Div. of Environmental Monitoring.
R. Todhunter, and R. Cunningham.
Technical Report No 73-001, January 1973. 61 p, 7 fig, 22 tab, 10 ref.

Descriptors: *Monitoring, *Water quality, Rivers, *Washington, *Coliforms, *Phosphates, Nutrients, Runoff, Streamflow, *Nitrogen.
Identifiers: *Stillaguamish River(Wash).

North and South Forks of the Stillaguamish River, Washington, have coliform problems during summer low flow. Coliform violations occurred in 100% of the samples at 2 stations during the July-September water quarter. High nitrogenous values were also frequently noted and orthophosphate concentrations were often above the critical levels. (Knapp-USGS)
W74-06273

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS: PART 1. SOURCE IDENTIFICATION AND EVALUATION.
Water Well Journal, p 45-47, 61-63, March 1974. 7 ref.

Descriptors: *Water pollution sources, *Groundwater, *Path of pollutants, Water wells, Pit recharge, Excavation.

Groundwater pollution can result from subsurface excavations of all types including water wells. Any time a hole is constructed which provides a possible avenue to bypass the surface filtering system, the chance for pollution is increased. (Knapp-USGS)
W74-06277

SEDIMENTATION RATES AND RECENT SEDIMENT HISTORY OF LAKES ONTARIO, ERIE AND HURON,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
For primary bibliographic entry see Field 2J.
W74-06282

OCCURRENCE AND ANALYSIS OF PETROLEUM HYDROCARBONS IN THE AQUATIC ENVIRONMENT,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W74-06289

ENVIRONMENT, WATER AND SEDIMENTS OF CHRISTIANSTED HARBOR, ST. CROIX,
Caribbean Research Inst., St. Thomas, Virgin Islands.
For primary bibliographic entry see Field 5C.
W74-06292

THEORY, DEVELOPMENT, AND UTILIZATION POTENTIAL OF THE BIOMILIEU CONCEPT,
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 2L.
W74-06332

BIONOMICS AND INTEGRATED CONTROL OF PLANT PARASITIC NEMATODES,
Agricultural Research Service, Beltsville, Md. Plant Science Research Div.
J. M. Good.
Journal of Environmental Quality, Vol 1, No 4, p 382-386, October-December, 1972. 1 tab, 41 ref.

Descriptors: *Nematodes, *Nematocides, Cultivation, Entomology, Microbiology, Soil microorganisms, Soil sterilants, Water pollution sources, *Parasitism, *Animal parasites, Biocontrol.
Identifiers: *Bionomics.

Establishment of an agroecosystem promotes the rapid increase of endemic pathogenic species and allows introduction of nonendemic species that quickly establish dominance. Nematodes now cause about 10% loss of yields of crops in the United States. About 20 highly effective nematicides are available to control nematodes and associated plant diseases in a number of crops. Nematode populations can be regulated by a number of soil management practices, including clean transplant, seed production, and crop rotations. Biological control can be achieved by addition of various types of organic matter to soil, some of which are not presently utilized, especially biodegradable solid wastes. Over 152 nematode-resistant crop varieties representing 17 major crops are available with resistance from one to three species of the 10 most destructive nematode types. Physical methods of control, including quarantine, sanitation, and crop destruction, are not vigorously applied. (Skogerboe-Colorado State)
W74-06336

NITROGEN TRACERS IN NITROGEN CYCLE STUDIES -- PAST USE AND FUTURE NEEDS,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural Development.
R. D. Hauck.
Journal of Environmental Quality, Vol 2, No 3, p 317-327, July-September, 1973. 2 tab, 56 ref.

Descriptors: *Nitrogen cycle, *Nitrogen compounds, Nitrogen fixation, Radioisotopes, Nutrient removal, Leaching, Water pollution sources, *Nitrates, Tracers, Ecosystems, Path of pollutants.

To achieve N balance in productive ecosystems, better quantitative estimates of N transformation rates are needed. Nitrogen tracers are indispensable for making many of these estimates. Either N15-enriched materials can be used. The use of N15-depleted materials is limited to studies where dilution from other N is less than 2,000-fold, but these materials are potentially available in ton amounts. Use of variations in natural N15 abundance may be useful in observing qualitative relationships among N cycle processes over large areas or extremely long time periods. Such use is questionable for obtaining quantitative information for short-term N transformation processes. Obvious information gaps are quantitative data on atmospheric N2 fixation and denitrification in cropped field soils and N transformation data for many other ecosystems. A program for computer data retrieval and correlation is outlined. (Skogerboe-Colorado State)
W74-06339

NITROGEN AND PHOSPHORUS COMPOSITION OF SURFACE RUNOFF AS AFFECTED BY TILLAGE METHOD,
Agricultural Research Service, Lafayette, Ind.
M. J. M. Romkens, D. W. Nelson, and J. V. Mannering.
Journal of Environmental Quality, Vol 2, No 2, p 292-295, April-June, 1973. 2 fig, 4 tab, 12 ref.

Descriptors: *Nitrogen, *Phosphorus, *Leaching, Nutrient removal, *Cultivation, Soil management, Fertilizers, Pollutants, Erosion, Sediments.

The effect of tillage methods on the nitrogen and phosphorus composition in runoff water and runoff sediment from corn plots was studied on Bedford silt loam soil by applying simulated rainstorms. Five tillage-planting systems were compared: coulter-plant, till-plant, chisel-plant, disk and coulter-plant, and conventional-plant. The coulter and chisel systems controlled soil loss, but runoff water contained high levels of soluble nitrogen and phosphorus from surface-applied fertilizer. The disk and till systems were less effective in controlling soil erosion, but had lower concentrations of soluble nitrogen and phosphorus in runoff water. Conventional tillage, in which fertilizers were plowed under, had the highest losses of soil and water but small losses of soluble nitrogen and phosphorus. However, high percentages of the total nutrients removed by runoff were components of the sediment from all treatments. (Skogerboe-Colorado State)
W74-06344

NITROGEN LOSSES IN SURFACE RUNOFF FROM AGRICULTURAL WATERSHEDS ON MISSOURI VALLEY LOESS,
Agricultural Research Service, Lincoln, Nebr.
G. E. Schuman, R. E. Burwell, R. F. Piest, and R. G. Spomer.
Journal of Environmental Quality, Vol 2, No 2, p 299-302, April-June, 1973. 5 tab, 15 ref.

Descriptors: *Nitrogen, *Leaching, *Nutrient removal, Solubility, Pollutants, Soil chemistry, Dispersion, Fertilizers, Sediments, Erosion, *Iowa, *Missouri River, Watersheds(Basins).

Nitrogen losses from surface runoff from four field-size (30 to 60-8 ha) watersheds in southwestern Iowa, near Treynor, were measured during 1969, 1970, and 1971. A contour-planted corn watershed and a pasture watershed were fertilized at the recommended N rate (168 kg/ha). A level-terraced and a contour-planted corn watershed were fertilized at 2.5 times this rate. The conservation practice of level-terraced corn or pasture was very effective in reducing water, sediment, and N yields when compared with the contour-planted corn watersheds. Annual water-soluble N losses were low from all watersheds. The three-year average annual solution N loss from the contour-planted corn watershed, fertilized at 2.5 times the recommended rate, was 3.05 kg/ha; the comparable watershed, fertilized at the recommended rate, lost only 1.89 kg/ha. (Skogerboe-Colorado State)
W74-06345

LONG-TERM EFFECTS OF MANURE, FERTILIZER, AND PLOW DEPTH ON CHEMICAL PROPERTIES OF SOILS AND NUTRIENT MOVEMENT IN A MONOCULTURE CORN SYSTEM,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.
M. L. Vitosh, J. F. Davis, and B. D. Knezek.
Journal of Environmental Quality, Vol 2, No 2, p 296-299, April-June, 1973. 5 tab, 20 ref.

Descriptors: *Farm wastes, *Fertilizers, Solid wastes, *Organic matter, *Nutrient removal, *Soil chemical properties, Corn(Field).

An evaluation of soil chemical properties, organic matter and nutrient accumulations, and nutrient movement and recovery after 6 and 9 years of annual fertilizer and manure applications to continuous corn was conducted on two soil types. Plow depths of 18 versus 30 cm had little or no effect on soil test values or nutrient accumulation patterns in the surface of a Conover-Hodunk loam soil. The pH value of both soils decreased slightly more than 0.1 pH unit per year with the annual application of 168 kg of N/ha as ammonium sulfate. The most favorable rate of manure for the Metea sandy loam soil was 22.4 metric tons/ha (10 tons/acre). Larger applications caused a significant buildup of exchangeable K in the surface and subsurface horizons and resulted in inefficient use of all nutrients. The K buildup was less critical on the loam soil or where silage rather than grain was removed. (Skogerboe-Colorado State)
W74-06346

NITROGEN-15 ENRICHMENT OF SOILS AND SOIL-DERIVED NITRATE,
Iowa State Univ., Ames. Dept. of Agronomy.
J. M. Bremner, and M. A. Tabatabai.
Journal of Environmental Quality, Vol 2, No 3, p 363-365, July-September, 1973. 3 tab, 12 ref.

Descriptors: *Nitrates, *Nitrogen, Leaching, Nutrient removal, Water pollution sources, *Radioisotopes.
Identifiers: *Nitrogen-15, Soil-derived nitrate.

Nitrogen-isotope analysis of soils and soil-derived nitrate showed that there is considerable variation in the N15 enrichment of the nitrate nitrogen produced on aerobic incubation of different soils and that the N15-enrichment of this nitrate nitrogen depends upon the time of incubation and can differ markedly from that of the total soil N. The data reported illustrate the impracticability of a recently proposed method of assessing the contribution of fertilizers to nitrate in surface waters that requires measurement of the natural N15 enrichment of soil- and fertilizer-derived nitrate. (See W72-04133) (Skogerboe-Colorado State)
W74-06349

CHEMICAL POLLUTION OF GROUND WATERS,
W. J. Kaufman.
Journal of the American Water Works Association, Vol 66, No 3, p 152-159, March 1974. 8 fig, 6 tab, 21 ref.

Descriptors: *Water pollution sources, *Path of pollutants, Groundwater, Nitrates, Heavy metals, *Detergents, *Nitrogen, Water quality, Oily water, *Gasoline, *Trace elements, Oil pollution, *Pesticides.

Contamination of groundwater has become a problem in some areas. Among the contaminants are pesticides, trace elements, and nitrate-nitrogen. A frequently encountered pollutant is petroleum products, especially gasoline. Generally, this problem is one of metropolitan areas and is localized around a point source. Municipal wastewater reclamation operations involving spread or injection have been responsible for detergent pollution of groundwaters, which, of course, raises questions regarding a variety of other industrial pollutants that may be present in municipal wastes and resist removal or degradation by the treatment processes normally employed. (Knapp-USGS)
W74-06365

WATER QUALITY AND OTHER ASPECTS OF GROUND-WATER RECHARGE IN SOUTHERN CALIFORNIA,
Toups Engineering, Inc, Santa Ana, Calif.
J. M. Toups.
Journal of the American Water Works Association, Vol 66, No 3, p 149-151, March 1974. 2 tab.

Descriptors: *Artificial recharge, *California, *Water quality, *Groundwater, *Water pollution sources, *Path of pollutants, Water management(Applied), Saline water intrusion.

Groundwater recharge became necessary in southern California during the 1950's because groundwater levels along the coastline had dropped below sea level in many places and seawater was intruding into the groundwater basins. Most of the recharge water is Colorado River water, which is of poorer quality than native groundwater or local streamflow. Recharge water, whether it be placed underground by spreading or by injection, can undergo water-quality changes through interaction with the soil. The changes are dependent upon the specific character of the recharge water and upon the soil type. (Knapp-USGS)
W74-06366

NITRATES AND GROUND-WATER MANAGEMENT IN THE FRESNO URBAN AREA,
K. D. Schmidt.
Journal of the American Water Works Association, Vol 66, No 3, p 146-148, March 1974. 2 fig, 6 ref.

Descriptors: *Groundwater, *Nitrates, *Water quality, *California, Water pollution sources, Urbanization, Septic tanks, Fertilizers, Waste water disposal, Sewage treatment.
Identifiers: *Fresno(Calif), Clovis(Calif).

The distribution of nitrate in groundwater of the Fresno-Clovis Metropolitan Area, California, is discussed. The natural quality of groundwater is excellent, but manmade disposal of high-nitrogen wastes in the urban area pose a potential pollution problem. Nitrates exceeding 45 ppm have been found in samples from wells in unsewered urban areas, near sewage-effluent percolation ponds, and near wineries on independent disposal systems. Natural nitrate concentrations appear to be less than 7 ppm in most urban-area groundwaters. Twelve wells had nitrate contents exceeding 45 ppm in 1970. Four of these wells were near the Fresno sewage-treatment plant, four were near the Clovis sewage-treatment plant, and two were near a winery. The primary sources of nitrate are sewage effluent, septic-tank effluent, wineries, meat-packing plants, and agricultural fertilizers. Little downgradient movement of contaminated groundwater occurs except near the Fresno sewage-treatment plant. Disposal of storm-runoff wastewater has not affected groundwater quality to any noticeable extent. (Knapp-USGS)
W74-06367

PROBLEMS OF WATER-QUALITY STANDARDS IN THE MANAGEMENT OF GROUND-WATER BASINS,
Pomeroy, Johnston and Bailey, Pasadena, Calif.
R. D. Pomeroy.
Journal of the American Water Works Association, Vol 66, No 3, p 143-146, March 1974. 1 fig, 1 ref.

Descriptors: *Water quality standards, *Groundwater, Water management(Applied), Solutes, *Electrical conductance, Nitrates, Carbonates, Salinity, Sodium, *Alkalinity.

Hardness, total dissolved salts, and alkali factor provide a fairly complete picture of groundwater quality with respect to major constituents, but many minor constituents need to be measured for the establishment of logical regulations. Electrical conductivity is very useful, correlating better with such properties as osmotic pressure than does TDS. Where water is used for irrigated agriculture, an important characteristic of the water is the alkali factor. This factor is an indicator of the effects on soil clays exerted by the residual soil solution after evaporation of a major part of the water. (Knapp-USGS)
W74-06368

WATER QUALITY REPORT, UPPER SNOQUALMIE RIVER SYSTEM, AUGUST 1972-NOVEMBER 1972,
Washington State Dept. of Ecology, Olympia.
P. Lee.
Technical Report No 73-004, February 1973. 14 p, 1 fig, 2 tab, 5 ref.

Descriptors: *Water quality, Rivers, *Washington, *Sampling, Nutrients, Chlorides,

Turbidity, Streamflow, Water temperature, Hydrogen ion concentration, Specific conductivity, Dissolved oxygen.
Identifiers: *Snoqualmie River(Wash).

Water samples were collected from stations established on the North, Middle, and South forks of the Snoqualmie River. The dissolved oxygen levels remained consistently high with the saturation rarely falling below 90%. River temperatures were mostly normal except on hot days when relatively high temperatures were found in the shallow, slow moving portions of the system. The pH values ranged from 6.7 to 7.7 with the higher values occurring at low flows. Chlorides remained at low concentrations. Conductivity levels are consistent with other freshwater rivers in the State and vary inversely with the river flow. Turbidity remained at minimal detection levels except following periods of rain. There is a constant nutrient load to the system throughout the year. The load is diluted by rain and surface runoff during periods other than the low flow season. (Knapp-USGS)
W74-06375

SURVEY OF THE EFFECT OF ASHTON PAPER MILL EFFLUENT DISCHARGE ON THE WATER OF THE RIVER SEVERN,
For primary bibliographic entry see Field 5C.
W74-06414

WATER QUALITY SIMULATION AND APPLICATION,
Environmental Research and Technology, Inc., Lexington, Mass.
P. S. Lombardo, and R. F. Ott.
Water Resources Bulletin, Vol 10, No 1, p 1-9, February 1974. 5 fig, 10 ref.

Descriptors: Water resources development, *Management, *Long-range planning, *Water quality, *Simulation analysis, *Optimum development plans, River basins, Water utilization, *Washington, Biochemical oxygen demand, Dissolved solids, Climatic data, Hydrologic data, Mathematical models, Systems analysis, Evaluation, Equations.
Identifiers: *Seattle(Wash.), Cedar River basin, Green River basin, Mass balance equation, Coliform dieaway, BOD decay.

An understanding of the causes of aquatic system behavior leading to proper system management is enhanced by knowledge obtained through water quality modeling. For accurate assessment of the quality of a water body, the dynamic and synergistic character of the aquatic environment necessitates knowing the temporal and spatial varying behavior of various water quality indices. Through mathematical formulations of the physical, biological and chemical processes occurring in the aquatic ecosystem, water quality models attempt to simulate the spatial and temporal variations in water quality indices. Described in detail is the Hydrocomp Water Quality Simulation Model and its application to the Seattle metropolitan area. Model input includes rate of coliform dieaway and BOD decay and climatological and hydrologic data; determination of total dissolved solids is done predominantly by a mass balance equation. The Seattle study searches for a plan to ensure the best utilization of the total water resources available to the Cedar and Green River basins, and includes evaluation of interbasin transfer. The Model provides a means for evaluating management policies in terms of the water quality indices. Through information generated on the probable resulting effects of policies, optimization of the various alternatives could be achieved. (Bell-Cornell)
W74-06419

OIL AND GAS SEEPS OF THE NORTHERN GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
D. H. Rosenberg.
In: A Review of the Oceanography and Renewable Resources of the Northern Gulf of Alaska: Alaska University Institute of Marine Science Report R72-23 (Sea Grant Report 73-3), Section 6, p 143-148, February 1972. 2 fig, 9 ref. NOAA Grant 04-3-158-41.

Descriptors: *Oil spills, *Pacific Ocean, Water pollution sources, Reviews, Oil fields, *Oil pollution, Oily water.
Identifiers: *Gulf of Alaska, *Oil and gas seeps.

None of the published reported oil and gas seeps in the Gulf of Alaska are known to issue directly into the sea, with the exception of one of the Katalla region which issues at the higher high-water line. However, many of the known seeps occur in streambeds that eventually drain into the Gulf of Alaska; therefore, a large quantity of oil has and still is drained into marine waters. The most likely area for finding such a seep is in the area of Katalla, as those seeps reported near Yakataga are all one or more miles inland. (See also W74-06426) (Knapp-USGS)
W74-06432

WATER QUALITY EFFECTS OF SEEPAGE FROM EARTHEN DAMS,
Geological Survey, Prescott, Ariz.
C. Yost, Jr., and J. W. Naney.
Journal of Hydrology, Vol 21, p 15-26, January 1974. 3 fig, 2 tab, 4 ref.

Descriptors: *Seepage, Surface waters, *Floodwater, *Structures, Impounded waters, *Salinity, Aqueous solutions, Geologic formation, Chemicals, Solubility, Mud, *Oklahoma, Earth dams, *Water quality.
Identifiers: Depletion, *Concentration, Chemical activities.

Analyses of surface and seepage waters from selected floodwater retarding structures in west-central Oklahoma show the salinity of seepage to be several times greater than that of the impounded waters. The increases in concentration of the several chemical components are not proportional. This phenomenon appears to be caused largely by simple solution, which is closely related to the chemical character of the geologic formation that provides the reservoir site and the earth fill of the dam. Concentration of certain chemical components in the seepage water progressively decreases as the structure ages. This is probably a function of depletion, which is related to the amounts and solubility of the parent materials subjected to solution. In contrast, the concentration of certain other components, such as iron and calcium, increases with time. The chemical activities within the accumulating mud on the bottom of the reservoir apparently cause these increases.
W74-06453

5C. Effects Of Pollution

NITROGEN BUDGET OF A NORTH CAROLINA ESTUARY,
North Carolina State Univ., Raleigh. Dept. of Zoology.
W. G. Harrison, and J. E. Hobbie.
Available from the National Technical Information Service as PB-230 382, $5.50 in paper copy, $1.45 in microfiche. Water Resources Research Institute of the University of North Carolina, Report UNC-WRRI No 74-86, January 1974. 172 p, 32 fig, 26 tab, 93 ref, 4 append. OWRR B-052-NC (1), 14-31-0001-3917.

Descriptors: *Nitrogen, *Ammonium, *Nutrients, Mass, *Urea, Estuaries, Eutrophication, *Nutrient cycle, Nitrates, Absorption, *North Carolina.
Identifiers: *Pamlico River estuary(No. Car).

Nitrogen concentrations in the Pamlico River estuary changed seasonally with highs occurring in winter and early spring and lows occurring in summer. Of the five forms of nitrogen measured (nitrite, nitrate, ammonium, dissolved organic and particulate nitrogen), the dissolved organic fraction was the largest. Concentrations of total inorganic nitrogen varied over distance and over time basically reflecting nitrate fluctuations. Seasonal peaks in nitrite and nitrate concentrations occurred in winter with concentrations at barely detectable levels in summer. Concentrations were consistently higher upstream and were reduced to low levels near the mouth of the estuary during all seasons. Ammonium was present in relatively high concentrations year round and was distributed uniformly throughout the estuary. Dissolved organic nitrogen concentrations were at least equivalent to inorganic nitrogen concentrations most of the year. Biological uptake and release were the most important pathways of nitrogen transformation. The calculated annual inorganic nitrogen budget for the estuary revealed that of the total inorganic nitrogen entering the system, nearly 40% disappeared. The predominant form in the tributary inputs was nitrate, which was reduced to nearly undetectable concentrations before leaving the estuary; nitrite followed a similar pattern. In contrast, ammonium concentrations in inflowing waters increased. At present, nitrogen appears to be a major factor limiting the production of the estuary although the amounts entering have caused no noticeable ill effects. (McJunkin-North Carolina)
W74-05954

THE EFFECT OF STRESS AND NON-STRESS CONDITIONS UPON THE INTERACTION OF PLECTONEMA BORYANUM AND THE LPP-PHYCOVIRUSES,
Delaware Univ., Newark. Dept. of Biological Sciences.
R. E. Cannon.
Available from the National Technical Information Service as PB-230 456, $5.50 in paper copy, $1.45 in microfiche. Ph D Thesis, June 1973. 40 p, 4 fig, 2 tab, 19 ref. OWRR A-016-DEL (4).

Descriptors: *Algae, *Plant viruses, Water pollution effects, Aquatic microbiology, Aquatic microorganisms, Plant pathology, *Cyanophyta.
Identifiers: *Algae-virus interactions, *Plectonema boryanum.

Lysogeny was established in Plectonema boryanum, a filamentous blue-green alga, by LPP-1D and LPP-2 phycoviruses after treatment of the alga with antibiotics, heavy metal, and nutrient limitation. Mitomycin C induction and viral neutralization confirm lysogeny. Infection of antibiotic treated cells by LPP-1 virus failed to establish lysogeny, indicating that LPP-1 is a virulent phycovirus while LPP-1D and LPP-2 were found to be temperate viruses. Continuous culture techniques were also used to study long-term population interactions of Plectonema and the LPP-viruses. After LPP-1 infection of sensitive algae, three oscillations occur in cell density with concomitant increases in virus before final stabilization of both algal and phycoviral populations. After LPP-1D and LPP-2 infection, only one fall in cell density occurs with a burst of virus particles. Resistant algae always repopulated; lysogeny was never established in chemostat experiments. (Knapp-USGS)
W74-05960

CROP AND FOOD CHAIN EFFECTS OF TOXIC ELEMENTS IN SLUDGES AND EFFLUENTS,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 5D.
W74-05978

SUCCESSION IN BENTHIC MACROFAUNA IN A SWEDISH FJORD SUBSEQUENT TO THE CLOSURE OF A SULPHITE PULP MILL,
Swedish Water and Air Pollution Research Lab., Gotenborg.
R. Rosenberg.
OIKOS, Vol 24, No 2, p 244-258, 1973. 14 fig, 1 tab, 41 ref.

Descriptors: *Pulp wastes, *Sulfites, *Biological communities, *Succession, Statistical methods, Growth rates, Population, *Fjords, Benthic fauna, Water pollution effects, Water quality control, Sampling, Mollusks, Dominant organisms, Distribution patterns, Crustaceans.
Identifiers: Species diversity, *Repopulation, Polychaetes, Echinoderms, Recovery, Anthozoa, Phoronids, Diversity index, *Sweden(Saltkallefjord).

Quantitative sampling of the fauna in a Swedish fjord was made in 1971 and 1972 to complement previous data about the faunal recovery after the cessation of the sulphite pulp mill in 1966. In 1972 the succession had approached a final phase in which the fauna had regained a composition similar to that found forty years earlier. The benthic faunal increment, expressed as dry weight, in Saltkallefjord over the period 1968-71 was roughly estimated to 20 percent and the yearly production to 70-80 tons on this 4.4 sq km area. Different indices have been used to describe the communities and the diversity. The succession showed a logistic pattern similar to population growth curves. (Mortland-Battelle)
W74-06013

SYSTEM SIMULATION TO IDENTIFY ENVIRONMENTAL RESEARCH NEEDS: MERCURY CONTAMINATION,
Bryn Mawr Coll., Pa. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W74-06014

ALGAL ASSAYS OF ARCHIPELAGO WATERS. QUANTITATIVE ASPECTS,
Lantbrukshogskolan, Uppsala (Sweden). Institutionen for Vaxtfysiologi.
P. E. B. Lindahl, and K. E. R. Melin.
OIKOS, Vol 24, No 2, p 171-178, 1973. 4 fig, 4 tab, 5 ref.

Descriptors: Freshwater, Brackish water, Sewage treatment, *Cyanophyta, *Phosphates, *Nitrates, Chelation, *Trace elements, Growth rates, Water pollution effects, Sewage, Water pollution effects, *Eutrophication, Filtration, Iron, Zinc, Manganese, Cobalt, Copper, Boron, Molybdenum, Cultures, Regression analysis, Heavy metals.
Identifiers: Oscillatoria agardhii, Aphanizomenon flos-aquae, Sample preparation, Data interpretation, Enrichment, Orthophosphates, *Sweden(Lake Malaren), *Sweden(Stockholm archipelago).

Eighteen surface water samples were collected during 1970 from Lake Malaren (freshwater) and to the outer part of the Stockholm Archipelago (brackish water). After filtration most samples were enriched with phosphate (P), nitrate (N) and chelated trace elements (TE), alone or in combination, and inoculated with blue-green algae, Oscillatoria agardhii or Aphanizomenon flos-aquae, isolated from the investigated area. The algae (not free from bacteria) were cultivated under standard conditions. The dry weight at harvesting was used to evaluate the growth-stimulating effect (in comparison with unenriched controls) of the additions. The yields of O. Agardhii (the controls and those with all three additions) were largest 17-26 km to the east of Slussen, the Stockholm lock. During the year the smallest growth occurred during summer. The results with A. flos-aquae followed a similar distribution pattern. Regression analysis of the results with O. Agardhii showed that enrichment with TE or P, along or together, did not stimulate growth. The addition of N, alone and in combinations with TE or P, stimulated the growth, in proportion to the growth in the unenriched water samples. The enrichment with P plus N plus TE gave the largest stimulation. (Mortland-Battelle)
W74-06015

RELATIONSHIPS BETWEEN LEVELS OF RADIOCESIUM IN DOMINANT PLANTS AND ARTHROPODS IN A CONTAMINATED STREAMBED COMMUNITY,
Savannah River Ecology Lab., Aiken, S.C.
G. E. Anderson, J. B. Gentry, and M. H. Smith.
OIKOS, Vol 24, No 2, p 165-170, 1973. 4 tab, 27 ref.

Descriptors: *Cesium, *Radioactive wastes, *Food webs, Flood plains, Vegetation, *Path of pollutants, Nuclear reactors, Radioisotopes, Streams, Insects, Statistical methods, Ecosystems, Regression analysis, Islands, Cooling water, Water pollution effects, Correlation analysis, *South Carolina.
Identifiers: *Arthropods, Sample preservation, Cesium radioisotopes, Scintillation counting, Broomsedge, Grasshoppers, Spiders, Leafhoppers, *Steel Creek(S.Car.).

For several years Steel Creek (South Carolina) received reactor cooling water and dissassembly basin effluents from two nuclear production reactors located near the stream's headwaters. When the stream no longer received reactor effluent in 1968, water flow was reduced and portions of the old streambed became exposed. Contaminated vegetation then became available to animals as food. Thus, a unique opportunity was created to study the fate of radionuclides in a natural system. Preliminary study of the Steel Creek system was an investigation into the radiocesium levels and concentration ratios of a plant-herbivore-predator food web. Emphasis has been to develop predictive models for radiocesium concentrations in the system. Samples of vegetation and arthropods were collected, analyzed for radiocesium by scintillation counting, and the results statistically analyzed to determine whether any relationship existed between radioisotope concentrations. Mean cesium concentrations were significantly higher on the islands than on floodplain areas. There were no consistent trends for increasing or decreasing concentration across trophic levels. However, the degree of linear correlation between radiocesium concentrations in different types of plants and arthropods was significant and makes possible a model to predict radiocesium levels in other components of the system. Predictability was highest between the various arthropod groups and lowest among the different plant types. Between the two possible producer-herbivore-predator associations (broomsedge-grasshopper-spider, and broomsedge-leafhopper-spider) radiocesium concentrations ratios differed significantly. (Mortland-Battelle)
W74-06016

NITROGEN AND PHOSPHORUS RELEASE FROM DECAYING WATER MILFOIL,
Wisconsin Univ., Madison. Dept. of Soil Science.
D. S. Nichols, and D. R. Keeney.
Hydrobiologia, Vol 42, No 4, p 509-525, September 28, 1973. 9 fig, 29 ref.

Descriptors: *Nitrogen, *Phosphorus, *Herbicides, *Carbon, Hydrogen ion concetration, Analytical techniques, Aquatic weeds, *Degradation(Decomposition), Sediments, Aeration, Biomass, Oxygen, Laboratory tests, Vegetation, Nitrites, Nitrates, Phosphates, Water analysis, Organic compounds, Nutrients, Water pollution sources, Organic matter.
Identifiers: *Water milfoil, Endothal, Organic carbon, Fate of pollutants.

To evaluate the net N and P contribution to water from herbicide-killed aquatic weeds, water milfoil containing 1.5 percent N and 0.30 percent P was killed with endothal and allowed to decompose, in the dark, in water only or sediment-water systems. Changes with time in dry weight, total N and P, and organic C in the plant material, and organic and inorganic forms of N and P in the water were determined. Plant decomposition was limited by N. Inorganic N was released by the sediment, and decomposition was more rapid when sediment was present. A smaller N requirement for decomposition under conditions of low 02 was postulated as a possible explanation of the more rapid decomposition observed in the absence of aeration. The presence of plant P in excess of decomposition requirements resulted in rapid accumulation of organic P, followed by inorganic P, in the water. Organic N appeared in the water early in the experiments, but was depleted rapidly, and inorganic N was apparently immobilized as soon as it was formed. In the presence of sediment, organic N and inorganic P levels were much lower. On treating of water milfoil with herbicide, rapid P release can be expected. It would appear that N release from decaying weeds is much slower than P. (Mortland-Battelle)
W74-06018

THE OXYGEN CONSUMPTION OF MAYFLY (EPHEMEROPTERA) AND STONEFLY (PLECOPTERA) LARVAE AT DIFFERENT OXYGEN CONCENTRATION,
Uppsala Univ., (Sweden). Inst. of Zoophysiology.
B. Nagell.
Hydrobiologia, Vol 42, No 4, p 461-489, September 28, 1973. 12 fig, 32 ref.

Descriptors: *Respiration, *Stoneflies, *Mayflies, Larvae, Metabolism, Water pollution effects, Behavior, Calcium, Temperature, Osmotic pressure, Ecosystems, Oxygen, Bioassay, Ecology, *Oxygen demand, Movement, *Aquatic insects.
Identifiers: *Oxygen consumption, Motor activity, Macroinvertebrates.

The aim of this investigation was to elucidate how four aquatic insect larvae, from different habitats and having different respiratory organs or types of respiratory regulation, react to a lowered oxygen concentration, and how their oxygen consumption is affected. The species investigated where the stoneflies Taeniopteryx nebulosa, Diura nanseni and Nemoura cinerea and the mayfly Cloeon dipterum. Water of known oxygen concentration was allowed to flow past the experimental larvae. The oxygen consumption of the larvae was calculated from the lowering of the oxygen concentration which ensued. The critical point on the curve representing mean oxygen consumption as a function of oxygen concentration was found to be a 4-5 mg 02/1 for Nemoura. The values refer to 8 C. No influence on the oxygen consumption of starvation for 4 to 5 days was found. No difference between the oxygen consumption values obtained in the presence or in the absence of calcium ions could be observed during the experiments. The basic picture obtained is a set of oxygen consumption values scattered between a curve connecting highest values obtained and a curve of the standard metabolism together with a zone in which the larvae are activated by reduced oxygen concentrations. (Mortland-Battelle)
W74-06019

SELF-PURIFICATION AND CILIATE COLONIZATION IN ACID ENVIRONMENT (MODEL EXPERIMENT), (SELBSTREINIGUNG UND CILIATENBESIEDLUNG IN SAUREM MILIEU (MODELLVERSUCHE),
Bonn Univ. (West Germany). Institut fuer Landwirtschaftliche Zoologie und Bienenkunde.
H. Bick, and E. F. Drews.
Hydrobiologia, Vol 42, No 4, p 393-402, September 28, 1973. 4 fig, 2 tab, 7 ref.

Descriptors: *Acidity, *Bacteria, *Protozoa, Freshwater, Lakes, Rivers, Air pollution effects, *Peptides, *Degradation(Decomposition), Hydrogen ion concentration, Nitrification, Ammonia, Bioassay, Population, Resistance, Water pollution effects, Oxidation, Cultures, Lethal limit, *Self-purification.
Identifiers: *Peptone decomposition.

Because acid precipitation originating from air pollution may increase the acidity of lakes and rivers, a study was conducted of the effects of acidification on the population dynamics of bacteria and protozoa associated with the decomposition of peptone. Increasing acidification with sulfuric acid caused reduced rate of decomposition and nitrification. Below pH 5 no oxidation of ammonia took place. Total counts of bacteria and ciliates as well as number of species of ciliated Protozoa decreased slowly within the pH-range 7 to 5, but rapidly at pH-values 5 to 3. The limits of tolerance to high hydrogen ion concentration are summarized for 29 species of freshwater ciliates. (Mortland-Battelle)
W74-06020

2, 4, 5-T,
Phytox Corp., College Station, Tex.
F. S. Davis.
In: Water-1972, AIChE Symposium Series No 129, Vol 69, 1973, p 269-278. 55 ref.

Descriptors: *2 4 5-T, *Pesticide toxicity, *Environmental effects, *Reviews, Persistence, Plant metabolism, Movement, 2 4-D, Degradation(Decomposition), Bacteria, Domestic animals, Public health, Laboratory animals, *Herbicides.
Identifiers: Biological magnification, Fate of pollutants, Carcinogenicity, Tumorigenicity, Teratogenicity.

Available literature on 2, 4, 5-T and other chlorophenoxy herbicides was reviewed to assess the effect of these pesticides on the environment. Studies of toxicity, carcinogenicity, tumorigenicity, and teratogenicity indicate that they do not pose any undue threat when used properly. The bulk of the evidence gathered to date suggests that the chlorophenoxy herbicides dissipate rapidly from soils where they serve as a carbon source for the microbial population. Plants metabolize or complex the compounds readily. If domestic animals or wildlife ingest forage containing these herbicides, the chemicals are largely excreted via the urine. The possibilities of biological magnification seem remote. In general, the net effect on the environment has been reflected in increased yields of desirable species for man's use. (Little-Battelle)
W74-06027

LIPOPOLYSACCHARIDE AND PROTEINS OF THE CELL ENVELOPE OF VIBRIO MARINUS, A MARINE BACTERIUM,
Georgetown Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W74-06028

OXYGEN CONSUMPTION OF LIMNOCALANUS MACRURUS SARS (CALANOIDA, COPEPODA) IN RELATION TO ENVIRONMENTAL CONDITIONS,
Guelph Univ. (Ontario). Dept. of Zoology.
J. C. Roff.
Canadian Journal of Zoology, Vol 51, No 8, p 877-885, August 1973. 5 fig, 1 tab, 28 ref.

Descriptors: *Copepods, Oxygen, *Respiration, *Water temperature, Lakes, Arctic, Population, Density, Lethal limit, Distribution patterns, Depth, *Canada, Seasonal, Oxygen demand, Heat resistance, Environmental effects.
Identifiers: Macroinvertebrates, *Oxygen consumption, *Arctic lakes, *Char Lake(N.W.T), Limnocalanus marcurus.

The oxygen consumption of Limnocalanus macrurus and its relationship to a number of environmental parameters were determined on specimens from two arctic lakes, both in the laboratory and in situ. The Q10 from O to 10C was 1.93 and from 5 to 15C was 2.20. The respiration rate increased shortly after capture of the animals and then declined to steady levels within 6 hr after capture. Experimental population densities within the range of 0.1 to 2 animals/ml had no effect on the adult respiration rate nor did the volume of the respiratory container. Experiments carried out in situ showed no relationship between depth of incubation and respiration rate, and did not differ significantly from the laboratory respiration rates. The upper lethal temperature was about 18C but animals could briefly withstand exposure to 21C. Lethal oxygen concentration was dependent on temperature, being about 0.8 mg/liter at O C. The relationship of these lethal levels to the distribution of the species is discussed. (Mortland-Battelle)
W74-06029

UPTAKE AND ACCUMULATION OF AN ORGANOCHLORINE INSECTICIDE (DIELDRIN) BY AN ESTUARINE MOLLUSC, RANGIA CUNEATA,
Texas A and M Univ., College Station. Dept. of Biology.
S. R. Petrocelli, A. R. Hanks, and J. Anderson.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 5, p 315-320, November 1973. 5 fig, 11 ref.

Descriptors: *Dieldrin, *Mollusks, *Bioassay, Absorption, Kinetics, Pesticide residues, Estuaries, Gas chromatography, *Texas, Water analysis, Path of pollutants, *Insecticides.
Identifiers: Bioaccumulation, Biological magnification, *Gas liquid chromatography, *Rangia cuneata, Sample preservation, Sample preparation, Cleanup, Biological samples, Macroinvertebrates, *Trinity Bay(Tex).

Clams (Rangia cuneata) were collected from Trinity Bay in Texas to study uptake and accumulation of dieldrin from dilute solution. The clams were acclimated for 1 to 2 weeks in holding tanks at 25C, 8.2 pH, and 15.6 percent salinity. They were then transferred to experiment tanks with water having like properties and a dieldrin concentration maintained at about 0.55 microgram/liter. Samples of clams and water were removed after 12, 24, 36, 48, 60, and 72 hours and after freezing and cleanup of the meat samples were analyzed for pesticide residue by gas-liquid chromatography. The results indicated that Rangia is capable of absorbing and concentrating dieldrin in its tissue to levels far above ambient. The smallest dieldrin residue in experimental clams was 38.2 micrograms/liter after 12 hours exposure and the largest 1226 micrograms/liter after 60 hours. Apparently the dieldrin is not noxious enough in the concentration used to affect siphoning and thus it is accumulated in quantities that may become a threat to the estuarine food web. (Mortland-Battelle)
W74-06031

MIREX INCORPORATION IN THE ENVIRONMENT: TOXICITY IN SELECTED FRESHWATER ORGANISMS,
Mississippi State Univ., State College. Dept. of Zoology.
S. M. Naqvi, and A. A. de la Cruz.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 5, p 305-308, November 1973. 3 tab, 9 ref.

Descriptors: *Pesticides, *Toxicity, Amphipoda, Dragonflies, Shrimp, *Bioassay, Ponds, Lakes, *Mississippi, Lethal limit, Computer programs, Water beetles, Chlorinated hydrocarbon, Pesticides, Insecticides.
Identifiers: *Mirex, Gyrinid beetles, Water striders, Hyallela azteca, Dineutes americanus, Gerris remigis, Palaemonetes kadiakensis, Beetles, Macroinvertebrates, Median tolerance limit.

A study was conducted to determine the toxicity of Mirex to the following pond invertebrates: amphipods (Hyallela azteca), dragonfly nymph (Macromia sp.), a gyrinid beetle (Dineutes americanus), a water strider (Gerris remigis), and a shrimp (Palaemonetes kadiakensis). The specimens were taken with nets from a garden pond and a managed lake in Mississippi. Bioassay solutions were prepared by serial dilution with tap water from a 1 percent stock solution of technical grade Mirex in acetone. LD sub 30, LD sub 50, LD sub 99 and upper and lower limits of lethal concentrations in parts per million for Gerris, Dineutes, and Palaemonetes were determined by probit analysis on an IBM 360-40 digital computer. Percent mortalities but not LD values were considered for Hyallela and Macromia nymph at 1 ppb and 1 ppm Mirex concentrations. Representative TL sub 50 values were: Gerris, 0.13 ppm at 24 hr; Dineutes, 0.04 at 72 hr; and Palaemonetes, 0.19 at 120 hr. Palaemonetes was most resistant, Dineutes next, and Gerris least resistant to Mirex. The results also show a delayed mortality effect of Mirex. (Mortland-Battelle)
W74-06032

EFFECT OF WATER HARDNESS ON THE TOLERANCE OF THE GUPPY TO BERYLLIUM SULFATE,
Johns Hopkins Univ., Baltimore, Md.
C. B. Slonim, and A. R. Slonim.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 5, p 295-301, November 1973. 4 fig, 2 tab, 9 ref.

Descriptors: *Hardness(Water), *Bioassay, Beryllium, Equations, Estimating, *Toxicity, Resistance, Hydrogen ion concentration, Water quality, Alkalinity, Dissolved oxygen, Conductivity, *Sulfates, Lethal limit, Water pollution effects.
Identifiers: *Guppy, *Beryllium sulfate.

Bioassays were conducted to investigate the effect of water hardness on the toxicity of BeSO4 to guppies. Four static tests were conducted simultaneously with four levels of hardness (22,150, 275, 400 mg/l) and Be concentrations ranging from 0.1 to 60 mg/l. In addition, two subsequent bioassays were conducted to assess the hypothetical relationship between the TL sub 50 and water hardness. Median tolerance limits for 96 hour tests were 20.0 mg Be/l at 400 mg/l hardness, 13.7 mg Be/l at 275 mg/l hardness, 6.1 mg Be/l at 150 mg/l hardness, and 0.16 mg Be/l at 22 mg/l hardness. Curves resulting from plots of percent survivors vs. Be concentrations show downturns as water hardness is lowered. In hard water, TL sub 50 values did not change significantly after 24-hr exposures, but in soft water they were significantly lower from 24-to 96-hr exposures. Equations are included which can be used to estimate the toxicity of BeSO4 to guppies at any given water hardness. (Mortland-Battelle)
W74-06034

THE ACUTE TOXICITY OF SOME HEAVY METAL IONS TOWARD BENTHIC ORGANISMS,
Marist Coll., Poughkeepsie, N.Y. Environmental Science Program.
R. Rehwoldt, L. Lasko, C. Shaw, and E. Wirhowski.
Bulletin of Environmental Contamination and Toxicology, Vol 50, No 5, p 291-294, November 1973. 2 tab, 10 ref.

Descriptors: *Toxicity, *New York, Copper, Zinc, Nickel, Cadmium, Mercury, Chromium, *Bioassay, *Benthic fauna, Oligochaetes, Amphipoda, Caddisflies, Diptera, Gastropods, Ions, Water quality, Water temperature, Hardness(Water), Hydrogen ion concentration, Dissolved oxygen, Mud bottom, Sampling, Dredging,

*Hudson River, *Heavy metals, Water pollution effects.
Identifiers: *Metal ions.

A study was conducted to determine the toxicity of some heavy metal ions toward benthic fauna in a freshwater region of the Hudson River. Metal ions evaluated were copper, zinc, nickel, cadmium, mercury, and chromium. Water quality during the experiment was maintained at 17C, 50 mg/l hardness, 7.6 pH, and 6.2 mg/l dissolved oxygen. Mercury was the most toxic ion toward the test organisms (bristle worms, scud, caddisflies, damselflies, midges, and snails) and was more toxic toward these organisms than toward fish studied earlier in the same area. However, with the exception of the scud and midge, benthic organisms tend to be more able to withstand heavy metal inputs than fish. (Mortland-Battelle)
W74-06035

PREDICTION OF INCIPIENT LETHAL LEVELS OF COPPER TO JUVENILE ATLANTIC SALMON IN THE PRESENCE OF HUMIC ACID BY CUPRIC ELECTRODE,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
P. Zitko, W. V. Carson, and W. G. Carson.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 6, p 265-271, November 1973. 2 fig, 1 tab, 13 ref.

Descriptors: *Copper, *Lethal limit, *Atlantic salmon, *Zinc, Humic acids, *Toxicity, *Electrodes, Bioassay, Hardness(Water), Calcium sulfate, Fulvic acids, Spectrophotometry, Heavy metals, Methodology, Chelation.
Identifiers: Ion selective electrodes, Incipient lethal levels.

This paper deals with the toxicity of copper and zinc to juvenile Atlantic salmon in the presence of humic acid, and with predictions of incipient lethal levels (ILL) of copper from the potential of a cupric ion selective electrode. The ILL of copper increases with increasing concentration of humic acid. The potential of the cupric ion selective electrode is a linear function of the total copper concentration in semilogarithmic coordinates. The ratio of predicted to calculated ILL's decreases with increasing hardness due to decreased binding of copper by humic acid at higher hardness. Humic acid at concentrations of 5 and 10 mg/l has no effect on the ILL of zinc to juvenile Atlantic salmon, possibly due to lower stability of humic acid - zinc complexes. The zinc - fulvic acid complex is approximately 10 times less stable than the corresponding copper - fulvic acid complex. The presented data indicate that the cupric ion selective electrode is a useful tool for predicting ILL of copper to juvenile Atlantic salmon in the presence of humic acid. The technique may very likely be extended to other copper-complexing substances such as lignosulfonates, pulp mill effluents in general, and various organic compounds. (Mortland-Battelle)
W74-06036

NOTES ON THE UPPER LETHAL TEMPERATURE OF THE DUSKYSTRIPE SHINER, NOTROPIS PILSBRYI, AND THE BLUEGILL, LEPOMIS MACROCHIRUS,
Arkansas Univ., Fayetteville. Dept. of Zoology.
G. D. Hickman, and M. R. Dewey.
Transactions of the American Fisheries Society, Vol 102, No 4, p 838-840, October 1973. 2 fig, 1 tab, 10 ref.

Descriptors: *Water temperature, *Lethal limit, *Shiners, *Sunfishes, *Thermal pollution, Resistance, Bioassay.
Identifiers: Survival, *Lethal temperature, Notropis pilsbryi, Lepomis macrochirus.

Sublethal, incipient upper lethal, and total lethal temperatures were obtained for the duskystripe shiner, Notropis pilsbryi, and the bluegill, Lepomis macrochirus. Both species were exposed to a gradual temperature increase of 2C per day and to sudden temperature increases after being acclimated to a temperature of 21.5C. Results indicate that the incipient upper lethal temperature of the bluegill, with a 2C rise in temperature per day, is 35.5C and that of the duskystripe shiner is approximately 32.0C. Resistance times of both species to a sudden temperature increase were also determined. (Mortland-Battelle)
W74-06037

THE INFLUENCE OF DISSOLVED OXYGEN ON THE GROWTH OF CHANNEL CATFISH,
Skidaway Inst. of Oceanography, Savannah, Ga.
J. W. Andrews, T. Murai, and G. Gibbons.
Transactions of the American Fisheries Society, Vol 102, No 4, p 835-838, October 1973. 1 fig, 2 tab, 15 ref.

Descriptors: *Dissolved oxygen, *Channel catfish, *Growth rates, Biomass, *Feeding rates, Water quality, Carbon dioxide, Ammonia, Resistance, Bioassay, Water pollution effects.
Identifiers: Blood samples, Hemoglobin, Hematocrit, Survival.

The long-term effects of three levels of dissolved oxygen (100,60 and 36 percent of air saturation) on channel catfish, Ictalurus punctatus, were evaluated under two feeding regimes - a constant rate of 3 percent of biomass daily and ad libitum. At ad libitum rates (6-week duration) average gains of 159, 124, and 65 g per fish were obtained in tanks containing oxygen at 100, 60, and 36 percent of saturation, respectively. In both experiments food consumption and efficiency were drastically reduced at 36 percent oxygen saturation. Survival rates were 100 percent in all groups, thus suggesting that disease and parasite problems were not enhanced by a hypoxic environment. In these studies catfish did not demonstrate a polycythemic response to hypoxic conditions. (Mortland-Battelle)
W74-06038

ACUTE TOXICITIES OF ANTIMYCIN A, BAYER 73, AND TFM TO THE OSTRACOD CYPRETTA KAWATAI,
Viterbo Coll., La Crosse, Wis. Dept. of Biology.
J. A. Kawatski.
Transactions of the American Fisheries Society, Vol 102, No 4, p 829-831, October 1973. 2 tab, 12 ref.

Descriptors: *Invertebrates, *Pesticide toxicity, Bioassay, Lethal limit, Piscicides, Molluscicides, Water pollution effects.
Identifiers: *Ostracods, *Antimycin A, *Bayer 73, *TFM, Synergistic effects, Median tolerance limit.

Static bioassays were conducted at 24C with the ostracod Cypretta kawatai in 1500-ml glass beakers to investigate the toxicity of antimycin A, TFM (95.7 percent 3-trifluoromethyl-4-nitrophenol), Bayer 73 (70 percent 2-aminoethanol salt of 2',5-dichloro-4'-nitrosalicylanilide), and mixtures of TFM and Bayer 73. Mortality observations were made at 24-hr intervals up to 96 hr. The 96-hr LC50 values were: antimycin A, 7.40 micrograms/l; TFM 7.10 mg/l; Bayer 73, 1.16 mg/l. The toxicity of a 50:50 mixture of TFM and Bayer 73 was simply additive (96-hr LC50, 3.03 mg/l), whereas a 98:2 combination of TFM and Bayer 73 was slightly synergistic (96-hr LC50, 5.00 mg/l). The three toxicants tested would have no significant immediate effect on C. kawatai when employed at normal field concentrations for short periods of time, however, if the toxicants were to persist in the ostracod's environment at application concentrations for more than 48 hours, material loss of ostracods could occur. (Mortland-Battelle)
W74-06039

THE EFFECTS OF DIBROM ON RESPIRATORY ACTIVITY OF THE STONEFLY, HYDROPERLA CROSBYI, HELLGRAMMITE, CORYDALUS CORNUTUS AND THE GOLDEN SHINER, NOTEMIGONUS CRYSOLEUCAS,
North Texas State Univ., Denton. Dept. of Biology.
A. W. Maki, K. W. Stewart, and J. K. G. Silvey.
Transactions of the American Fisheries Society, Vol 102, No 4, p 806-815, October 1973. 6 fig, 3 tab, 34 ref.

Descriptors: *Stoneflies, *Shiners, *Respiration, *Insecticides, Oxygen, Water pollution effects, Bioassay, Pesticide toxicity, Resistance, Laboratory equipment, Larvae, Design criteria, Statistical methods, Lethal limit.
Identifiers: *Hellgrammites, *Dibrom, Macroinvertebrates, Continuous flow technique, Oxygen consumption, Respirometers, Hydroperla crosbyi, Corydalus cornutus, Notemigonus crysoleucas.

The respiratory activity of three aquatic animals, selected from different pollution index classifications, was examined in the presence of sublethal concentrations of Dibrom, a commonly used, broad spectrum, organophosphate insecticide. The oxygen consumption of Hydroperla crosbyi (Needham and Classen), Corydalus cornutus L. and Notemigonus crysoleucas was measured in a specially designed flowing-water respirometer, housed in an environmental chamber. The acute toxicity of Dibrom, measured as 24-hr LC50's for these animals, was compared in both static and flowing-water bioassays and found to be significantly more toxic to both the hellgrammites and stoneflies in the flowing system (LC50: 6.8 ppm and 11.4 ppb, respectively) than in the static bioassay (LC50: 9.5 ppm and 16.0 ppb, respectively). There was a marked difference in the toxicity of Dibrom to golden shiners between flowing and static systems but this was not statistically significant at the 95 percent confidence level. Sublethal Dibrom concentrations significantly affected oxygen consumption (QO2) in all test animals, and reduced their tolerance to low oxygen tensions. The ability of the golden shiner to tolerate low oxygen tensions was reduced by 50 percent by exposure to 5 ppm Dibrom concentrations. Stonefly body undulations and hellgrammite gill beats were increased by exposure to sublethal toxicant levels in the flowing system. The flowing-water respirometer offers an approach to simulate the lotic environment in bioassays and laboratory assessments of the effects of pollutants on respiration and other organism responses. (Mortland-Battelle)
W74-06040

EFFECTS OF ARTIFICIAL HYPOLIMNION AERATION AND RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON) DEPTH DISTRIBUTION,
Michigan State Univ., East Lansing.
A. W. Fast.
Transactions of the American Fisheries Society, Vol 102, No 4, p 715-722, October 1973. 7 fig, 21 ref.

Descriptors: *Rainbow trout, *Distribution patterns, *Aeration, Depth, *Hypolimnion, Oxygen, Thermal stratification, Water temperature, *Michigan, *Eutrophication.
Identifiers: *Hemlock Lake(Mich).

Hemlock Lake, an eutrophic and meromictic Michigan lake, was artificially aerated by hypolimnetic aeration. This aeration system involved a special aeration tower and compressed air injection. Hypolimnetic oxygen concentrations increased from zero to saturation during aeration. Thermal stratification was gradually reduced by the aeration, but the lake remained thermally stratified for 10 weeks during aeration. Before aeration, rainbow trout (Salmo gairdneri Richardson) were limited to shallow depths by the anaerobic hypolimnion. They distributed to the deepest

depths soon after aeration began and occupied the entire lake during artificial aeration. (Mortland-Battelle)
W74-06041

METHYL MERCURY ACCUMULATION IN AN AQUATIC FOOD CHAIN. A MODEL AND SOME IMPLICATIONS FOR RESEARCH PLANNING,
Swedish Water and Air Pollution Research Lab., Stockholm.
For primary bibliographic entry see Field 5B.
W74-06042

BENTHIC FAUNA AND ZOOPLANKTON IN SOME POLLUTED SWEDISH ESTUARIES,
Uppsala Univ. (Sweden). Inst. of Zoology.
I. Olsson, R. Rosenberg, and E. Olundh.
AMBIO, Vol 2, No 5, p 158-163, 1973. 9 fig, 16 ref.

Descriptors: *Benthic fauna, *Zooplankton, *Estuaries, Salinity, Water pollution effects, Annelids, Crustaceans, Oxygen, Worms, Copepods, Bioindicators, Dominant organisms, Clams, Aquatic populations.
Identifiers: Ostracods, Foraminifera, Species diversity, Macroinvertebrates, *Sweden, Saltkallefjord, Byfjorden, Gothenburg estuary, Kungsbackafjorden.

Four more-or-less polluted estuaries on the Swedish west coast are compared regarding bottom fauna of different sizes, and zooplankton. The salinity in these almost non-tidal waters varies from estuary to estuary and decreases from north to south. As it was expected that the physical and chemical environment in the estuarine systems might be reflected in the faunal communities, the purpose was to classify the systems in respect to each other on a faunal basis, especially with regard to the pollution aspects. The meiofauna of the bottom (size 0.1-1 mm), represented by foraminifers (one-celled animals) and annelids (segmented worms), seemed more to reflect differences in pollution than differences in salinity. A reduced ostracod fauna (crustaceans) was an outstanding feature. Few species appeared in all estuaries. Even the macrofauna of the bottom (size greater than or equal to 1 mm) showed that the effects of pollution in Byfjorden were restricted to the inner areas. In a comparison with another estuary, Saltkallefjorden, nowadays almost non-polluted and recovered, there was a remarkably uniform fauna at certain localities in the two estuaries. If distance to river-mouth is taken into consideration, both meio- and macrofaunal composition seemed to be more similar between the various estuaries than within individual estuaries, reflecting the short-distance changes of the environment. Compared to the bottom fauna, the zooplankton (greater than or equal to 0.16 mm) showed the least differences between the various estuaries. The composition seemed to be much the same, with copepods (crustaceans) as the dominating group. (Mortland-Battelle)
W74-06043

INDICATIONS OF DISTURBANCES IN THE NITRIFICATION PROCESS IN A HEAVILY NITROGEN-POLLUTED WATER BODY,
Swedish Water and Air Pollution Research Lab., Stockholm.
L. Landner, and T. Larsson.
AMBIO, Vol 2, No 5, p 154-157, 1973. 6 fig, 17 ref.

Descriptors: *Nitrification, *Water pollution effects, *Nitrogen fixing bacteria, Nitrogen, Nitrites, Oxygen, Ammonium compounds, Nitrates, Benthos, Metabolism, Respiration, Sampling, Oxidation, *Bioindicators, Ecosystems, Lakes, Nitrogen compounds, Industrial water, Sediments, Cycling nutrients, Aquatic populations, Biological communities.
Identifiers: Nitrobacter, Nitrosomonas, Biotransformation, *Sweden(Lake Malaren).

When high concentrations of nitrite were repeatedly detected in the Bay of Koping, Lake Malaren (Sweden), a study was initiated to analyze the autotrophic oxidation of ammonium to nitrate. The number of denitrifiers and of heterotrophs was also determined. Water and sediment samples were taken with sterilized NIVA and Jenkins samplers on four occasions, and the numbers of autotrophically nitrifying bacteria were determined by indirect most probable number procedures. It was found that Nitrosomonas were 100 to 10,000 times more abundant than Nitrobacter in the bottom water as well as in the sediment surface of the bay. The activity of Nitrobacter in the bay was also reduced, clearly indicating a disturbance of the oxidation of nitrite to nitrate. (Mortland-Battelle)
W74-06044

EFFECTS OF THERMAL ADDITIONS FROM THE YELLOWSTONE GEYSER BASINS ON THE BENTHIC ALGAE OF THE FIREHOLE RIVER,
Wisconsin Univ., Madison. Dept. of Bacteriology.
C. W. Boylen, and T. D. Brock.
Ecology, Vol 54, No 6, p 1282-1291, Autumn 1973. 8 fig, 2 tab, 27 ref.

Descriptors: *Thermal pollution, *Benthic flora, *Geysers, *Water temperature, Alkalinity, Hydrogen ion concentration, Conductivity, Phosphates, Chlorides, Nitrates, Ammonia, Chlorophyll, Growth rates, Photosynthesis, Radioactivity techniques, *Aquatic algae, Standing crops, Hot springs, Carbon dioxide, Nutrients, Water quality, Analytical techniques, Biomass, Systematics, Sampling, Adaptation, Water analysis, On-site tests, *Wyoming.
Identifiers: *Firehole River(Wyo).

During the spring and summer of 1971 and 1972 quantitative measurements of temperature, water chemistry, and standing crop of benthic algal mats were made at a series of stations along the Firehole River as it flows through the main geyser basins of Yellowstone National Park. As the river flowed through the thermal areas, the temperature gradually increased to a maximum daily midsummer temperature 12 degrees higher than the unheated upper portion of the river (15 to 27C), and the river began cooling when the thermal additions to the river ceased. The river was coldest in early June, when maximum input from melting snow occurred, and remained relatively warm in the heated areas throughout the winter. Alkalinity pH, conductivity, phosphate, and chloride also increased markedly; nitrate and ammonium concentrations appeared not to be influenced by the additions of hot spring water. The quantity of chlorophyll per unit area extracted from epilithic algal mats also increased with the amount of thermal water input to 20 times that in the unheated control areas. The apparent growth rates of benthic algae calculated from periodic quantitative sampling of cleaned rocks were over fivefold greater in the warmer than in the cooler portion of the river. The temperature optimum for CO2 fixation paralleled the midsummer temperature of the habitat although it averaged about 3 degrees higher at each station. The results suggest that higher temperatures from the additions of thermal water increase the algal standing crop through increase in growth rate of the algae, and that the algae in the heated portion of the river are optimally adapted to the temperatures of their habitats. (Mortland-Battelle)
W74-06046

MULTIVARIATE APPROACHES TO ALGAL STRATAGEMS AND TACTICS IN SYSTEMS ANALYSIS OF PHYTOPLANKTON,
Wisconsin Univ., Madison. Dept. of Botany.
T. F. H. Allen, and J. F. Koonce.
Ecology, Vol 54, No 6, p 1234-1246, Autumn 1973. 12 fig, 3 tab, 37 ref.

Descriptors: *Phytoplankton, *Statistical methods, *Productivity, Growth rates, Absorption, Biomass, Biological communities, Ecosystems, Model studies, Grazing, Seasonal, Standing crops, Algae, Niches, Competition, Distribution patterns, Dominant organisms, *Wisconsin.
Identifiers: Data interpretation, *Multivariate analysis, *Lake Wingra(Wis).

Numerical classifications and principal components ordinations were performed on species from 57 weekly samples of phytoplankton from Lake Wingra. The data were considered in absolute and relative terms before and after transformation to presence/absence and logarithmic quantities. The data were also analyzed, taking into account growth rates in the samples, by means of a transformation that replaced the scores of species present by the productivity of the sample as determined by C-14 uptake/biomass. It is shown that different transformations can reveal different but biologically meaningful aspects of the data. These different biological aspects are species similarities based on either short-term survival expedients in particular environmental circumstances, species tactics, or long-range growth patterns, involving breadth of tolerance and place in the community, that is, species stratagems. Most phytoplankton species in Lake Wingra adopt one of three stratagems: either ungrazed, slow-growing and very persistent, or ungrazed, fast-growing and of intermediate duration, or grazed fast-growing and ephemeral. Tactical information is relevant to particular systems, while strategic information is needed in ecosystem comparison and for models applicable to several systems. (Mortland-Battelle)
W74-06047

EFFECT OF CHELATION ON TOXICITY OF COPPER,
Leigh (W. and J.) and Co., Bolton (England).
O. P. Morris, and G. Russell.
Marine Pollution Bulletin, Vol 4, No 10, p 159-160, October 1973. 1 fig, 9 ref.

Descriptors: *Chelation, *Toxicity, *Copper, *Marine algae, Organic compounds, Cultures, Aqueous solutions, Chlorides, Growth rates, Volumetric analysis, Bioassay, Heavy metals, Water pollution effects, Sea water, Phaeophyta, Kelps.
Identifiers: *EDTA, Erd Schreiber medium, Culture media, *Ectocarpus siliculosus.

The effect of chelation on copper toxicity to algae was studied in the laboratory using EDTA as a chelating agent and Ectocarpus siliculosus as the algae. Three growth media were used. The basic medium was a formulation with Na2 EDTA excluded to make the medium as inorganic as possible. The second consisted of the basic formulation plus 3.7 mg EDTA per liter. The third was 'Erd Schreiber' medium, which contains soil extract. A series of copper concentrations was prepared in each medium giving from 0.00 to 1.00 mg Cu (2 plus)/liter. The plant material was inoculated into the media and cultures were grown at 11C and a continuous light intensity of 2,700 lux. Volumetric analysis of growth was made after 35 days. The growth rate of Ectocarpus in the basic medium dropped very rapidly with increasing copper, and there was no increase in plant volume over 35 days, at a concentration of 0.45 mg Cu (2 plus)/l. The presence of EDTA increased this critical concentration, the Ectocarpus continuing to show some growth up to a level of over 0.85 mg Cu (2 plus)/l. It was concluded that the effect of chelation on the toxicity of copper to Ectocarpus siliculosus in culture is very marked. (Mortland-Battelle)
W74-06048

POLLUTION STUDIES IN THE CLYDE SEA AREA,
Marine Lab., Aberdeen (Scotland).

J. H. Steele, A. D. McIntyre, R. Johnston, I. G. Baxter, and G. Topping.
Marine Pollution Bulletin, Vol 4, No 10, p 153-157, October 1973. 3 fig, 2 tab, 8 ref.

Descriptors: *Water pollution effects, *Water quality, *Heavy metals, Polychlorinated biphenyls, Oil wastes, *Bioassay, Sewage sludge, Fish, Zooplankton, Benthic fauna, *Pesticide residues, Thermal pollution, Copper, Lead, Zinc, Cadmium, Mercury, Dieldrin, DDT, Heated water, Industrial wastes, Sediments, Chlorophyll, Primary productivity, Food chains, Shellfish, DDD, DDE, Fish eggs, Toxicity, Larvae, Grazing, Diatoms, Copepods, Herrings.
Identifiers: Lubricating oil, Fuel oil, Flatfish, *Scotland(Firth of Clyde), Plaice, Tellina tenuis, Scallops, Cod(Fish), Haddock, Mackerel, Saithe, Whiting.

The water quality and the effects of pollution on the Firth of Clyde are being monitored; surveys were made of the plankton, benthic and fish populations of the area. Pollutants identified were sewage sludge; heavy metals such as Cu, Pb, Zn, Cd, and Hg; trace organics; PCB's; pesticides such as dieldrin and DDT; crude fuel and lubricating oils; and heated water. Levels of metals in fish, shellfish, sediments, zooplankton, and water and the levels of dieldrin, DDE, TDE, DDT, and PCB in fish are listed. Bioassays with flatfish, plaice, the bivalve Tellina tenuis, and herring eggs and larvae show that copper concentrations of 10 micrograms/l have adverse effects on the food chain leading to young flatfish and at levels above this, herring eggs are affected. Excess nutrients apparently lower grazing rates which may be the reason for the occurrence of higher chlorophyll concentrations in the Firth. There are three main conclusions from this study. (1) There is evidence of enhanced levels of contaminants in the Clyde. (2) This evidence is found most obviously at intermediate trophic levels (Tellina and zooplankton), rather than in the water or the fish. (3) Experiments show direct effects on organisms from this area which are comparable to effects found by contaminated additions to unpolluted waters, but the exact cause or causes remain to be determined. (Little-Battelle)
W74-06049

THE DISTRIBUTION OF ASELLUS AQUATICUS (L.) AND PROASELLUS MERIDIANUS (RAC.) IN THE SOUTHWESTERN PART OF THE NETHERLANDS,
Delta Inst. for Hydrobiologycal Studies, Yerseke (Netherlands).
W. J. Wolff.
Hydrobiologia, Vol 42, No 4, p 381-392, September 28, 1973. 7 fig, 2 tab, 22 ref.

Descriptors: *Distribution patterns, *Salinity, Systematics, Water pollution effects, Habitats, Water quality, Brackish water, *Isopods, Sampling, Salts, Phenols, Resistance, Water quality. 25*Asellus aquaticus, *Proasellus meridianus, *Netherlands, Macroinvertebrates.

The freshwater isopods Asellus aquaticus and Proasellus meridianus are common in the Netherlands. The distribution of both species in the southwestern part of the Netherlands seems to indicate that small ecological differences between both species exist. These differences are discussed in relation to the results of previous authors. The ecological similarity of the two species apparently may be extended to their tolerance to raised salinities. On the other hand it was possible to confirm that these species react differently to water pollution. The main conclusion of this study is, however, that A. aquaticus and P. meridianus form an extremely interesting couple of species. A study of the way they colonize the future fresh Delta lakes therefore may result in valuable data on interaction of closely related species, and also has considerable theoretical interest. Such a study is planned. (Mortland-Battelle)
W74-06051

PESTICIDE RESIDUES IN NATURAL FISH POPULATIONS OF THE SMOKY HILL RIVER OF WESTERN KANSAS - 1967-69, 10H. E. KLAASSEN, AND
Kansas State Univ., Manhattan. Div. of Biology.
For primary bibliographic entry see Field 5A.
W74-06052

ACCUMULATION AND MOVEMENT OF MIREX IN SELECTED ESTUARIES OF SOUTH CAROLINA, 1969-71,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab.
For primary bibliographic entry see Field 5B.
W74-06054

DIVERSITY IN FRESH-WATER PHYTOPLANKTON,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
B. Moss.
The American Midland Naturalist, Vol 90, No 2, p 341-355, October 1973. 4 fig, 1 tab, 46 ref.

Descriptors: *Phytoplankton, *Seasonal, *Nutrients, *Mathematical models, Water quality, Eutrophication, Succession, Dominant organisms, Equations, Pigments, Biomass, *Michigan, Lakes.
Identifiers: *Species diversity, Data interpretation, Priddly Pool(U. K.), Abbot's Pond(U. K.), Gull Lake(Mich.), United Kingdom.

Phytoplankton samples were collected from three water bodies, Gull Lake (Kalamazoo, Mich.), Priddy Pool, and Abbot's Pond (Somerset, U. K.), for as long as 2 years, the species counted, and diversity calculated using a derivative of the Shannon formula. In the more eutrophic bodies, diversity increased in summer but was low in winter. Diversity decreased with increased fertility of the water. The data confirm predictions made in the literature, but existing explanations of the phenomena are considered unnecessarily complex. An explanation based on the balance of cell numbers between overlapping populations of several species is given, supported by a simple mathematical model. The pigment diversity index and the nature of succession (periodicity) in freshwater phytoplankton are discussed. (Little-Battelle)
W74-06057

INABILITY TO DETECT SPORES OF CLOSTRIDIUM BOTULINUM IN FISH PROTEIN CONCENTRATES (FPC),
Department of National Health and Welfare, Ottawa (Ontario). Food and Drug Research Lab.
For primary bibliographic entry see Field 5A.
W74-06058

ENDRIN UPTAKE AND RELEASE BY FINGERLING CHANNEL CATFISH (ICTALURUS PUNCTATUS),
Bureau of Sport Fisheries and Wildlife, Marion, Ala. Southeastern Fish Cultural Lab.
R. L. Argyle, G. C. Williams, and H. K. Dupree.
Journal of the Fisheries Research Board of Canada, Vol 30, No 11, p 1743-1744, November 1973. 3 ref.

Descriptors: *Bioassay, *Channel catfish, *Mortality, *Growth rates, *Endrin, Absorption, Fishkill, Gas chromatography, Resistance, Foods, Juvenile fish, Fry.
Identifiers: Elimination, *Bioaccumulation, Biological samples, Tissue, Sample preparation.

Fingerling channel catfish (Ictalurus punctatus) offered diets containing 0.04-4.0 micrograms endrin/g food (dry weight) rapidly accumulated the pesticide. Amounts in the tissues as determined by gas chromatography were directly proportional to amounts in the food. Dietary endrin had no measurable effect on growth or mortality. After endrin was withdrawn from the diet, it rapidly disappeared and could not be detected after 41 days. In fish exposed to 0.5 microgram endrin/liter of water, mortalities began at tissue levels of 0.7 microgram endrin/g of wet whole fish and total mortality occurred at levels near 1.0 microgram/g. (Little-Battelle)
W74-06060

OCCURRENCE OF DDT RESIDUES IN BELUGA WHALES (DELPHINAPTERUS LEUCAS) FROM THE MACKENZIE DELTA, N.W.T.,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 5A.
W74-06061

INFLUENCE OF ENVIRONMENTAL EXPERIENCE ON RESPONSE OF YEARLING RAINBOW TROUT (SALMO GARIDNERI) TO A BLACK AND WHITE SUBSTRATE,
Guelph Univ. (Ontario). Coll. of Biological Science.
J. A. Ritter, and H. R. MacCrimmon.
Journal of the Fisheries Research Board of Canada, Vol 30, No 11, p 1740-1742, November 1973. 1 tab, 6 ref.

Descriptors: *Rainbow trout, *Color, *Distribution patterns, Sediments, Bioassay, Environmental effects, *Fish behavior, Juvenile fish.
Identifiers: *Substrates.

Yearling rainbow trout (Salmo gairdneri) selected black substrate regardless of size or rearing experience when first introduced into an experimental tank offering a choice of black or white. Differences in the degree of black selection among the various lots of the same strain during the initial 120 min of exposure, under an illumination of .01 lx, were correlated only with the level of swimming activity. By 24 hr, only pond-reared fish continued to select black while laboratory-reared fish were randomly distributed over black and white. The continuing wariness of only the pond-reared fish reveals the long-term effect of prior experience of juvenile trout behavior. This finding indicates the possible feasibility of environmental conditioning for wariness in the artificial propagation of hatchery-reared fish for the live release. (Little-Battelle)
W74-06063

METABOLISM OF SELECTED PESTICIDES BY MARINE MICROORGANISMS,
Syracuse Univ. Research Corp., N.Y. Life Sciences Div.
H. C. Sikka, S. Miyazaki, and C. P. Rice.
Available from the National Technical Information Service as AD-763 410, $3.00 in paper copy, $1.45 in microfiche. Report No. SURC-TR 73 520, Annual Report No. 2, June 1973. 16 p, 4 tab, 7 ref. Project No. NR-306 050. Contract No. N00014-72 C 0010.

Descriptors: *Metabolism, *Microbial degradation, *Marine microorganisms, Absorption, Radioactivity techniques, Biodegradation, Photosynthesis, Growth rates, Marine bacteria, Marine algae, Marine fungi, Pesticide toxicity, Plant physiology, Water pollution effects, Phenolic pesticides, Yeasts, Plant growth, Cultures, Incubation, Analytical techniques, Carbamate pesticides, Pollutant identification.
Identifiers: *Carbaryl, *Naphthols, *Fate of pollutants, Bacterial physiology, Metabolites, Cyclotella, Dunaliella, Flavobacterium, Rhodotorula, Spirillum, Liquid scintillation, Brevibacterium, Candida, Trichosporon, Culture media, Humicola, Serratia, Algal physiology, Degradation products, Aspergillus, Halosphenica, Culcitaena.

A number of marine microorganisms including algae, bacteria, fungi and yeasts were tested for their ability to metabolize carbaryl (1-naphthyl-N-methyl-carbamate) and 1-naphthol. None of the

species included in the study were able to degrade carbaryl to a significant extent. Conversion of 1-naphthol to ether-soluble and water-soluble metabolites was observed in cultures of Culcitalna achraspora, Halosphaeria mediosetigera, Humicola alopallonella, Aspergillus fumigatus, Serratia marina, Spirillum sp. and Flavobacterium sp. The first three organisms were more effective in degrading 1-naphthol to water-soluble metabolites than the remaining species. A very small amount of carbaryl was metabolized to water-soluble metabolites by the algae Cyclotella nana and Dunaliella tertiolecta. 1-naphthol was more toxic to the algae Cyclotella and Dunaliella than the parent compound, carbaryl. Cyclotella was more sensitive to both carbaryl and 1-naphtol than Dunaliella. Treatment with 0.00002 M carbaryl or 1-naphthol reduced photosynthetic CO2 fixation in Cyclotella. (Mortland-Battelle)
W74-06066

A METHOD FOR THE ISOLATION OF NAEGLERIA SPECIES FROM WATER SAMPLES,
Institute of Medical and Veterinary Science, Adelaide (Australia). Amoebic Research Unit.
A. Jamieson, and K. Anderson.
Pathology. Vol 5, No 1, p 55-58. 1973.
Identifiers: Escherichia-Coli, *Flagellates, *Isolation, *Naegleria-Spp, *Pathogenicity, *Water sampling, Mice.

Strains of Naegleria (130) were isolated from 400 water samples by membrane filtration and inoculation of agar plates spread with heat-killed Escherichia coli. All were identified as flagellates in hanging drops and 2 were pathogenic to mice inoculated 36 to 72 hr after sampling.--Copyright 1973, Biological Abstracts, Inc.
W74-06068

THE DISTRIBUTION OF HEAVY METALS IN REEF-DWELLING GROUPERS IN THE GULF OF MEXICO AND BAHAMA ISLANDS,
Texas A and M Univ. College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W74-06071

BENTHIC OXYGEN DEMANDS OF HOUSTON SHIP CHANNEL SEDIMENTS,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
T. D. Reynolds, R. W. Hann, Jr., and W. F. Priebe.
Available from the National Technical Information Service as COM73-11329 $3.50 in paper copy, $1.45 in microfiche. Report No. TAMU-SG-73-204, June 1973. 58 p, 17 fig, 4 tab, 47 ref, append. Grant Nos. NOAA-04-3-158-18, EPA-WP-24001, and EPA R and D 16090 DQW.

Descriptors: *Dissolved oxygen, *Oxygen demand, *Bottom sediments, Sea water, *Biochemical oxygen demand, Water quality, Water temperature, Mixing, Sludge, Mud, Suspended solids, Absorption, Mercury, Lead, Zinc, Copper, Chromium, Nickel, Iron, Manganese, *Texas.
Identifiers: *Houston Ship Channel(Tex), Marine environment, Electrolytic oxygen cells, Arsenic, Silver.

The purpose of this research was to determine the benthic demand of the deposits in the Houston Ship Channel for use in modeling the channel for dissolved oxygen. The scope of the study included: (1) collection of bottom samples; (2) determining characteristics of the sludge such as biochemical oxygen demand (BOD), heavy metals, etc.; (3) use of galvanic oxygen cells in determining oxygen uptake rates in grams of oxygen per hour per square meter, or other units; (4) determination of benthic demands at different temperatures to obtain a demand versus temperature correlation; and (5) the determination of mixing effects. The benthic demands were determined using electrolytic biochemical oxygen demand cells and the sludges were placed in the cells within 24 hours after collection. Nine sludge samples were taken from the entire 24-mile reach of the channel and benthic demands were determined at 32C. Correlations were made relating benthic demand to the five-day biochemical oxygen demand of the sludges. The water in the cells was recirculated to the extent that the sludge surface was scoured to determine if a scoured condition increased the benthic demand over that of a quiescent condition. Mass transfer fundamentals were used to determine the benthic demand as a function of ultimate benthic demand, time, and molecular diffusivity. (Mortland-Battelle)
W74-06073

ECOLOGY OF SMALL BOAT MARINAS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
S. W. Nixon, C. A. Oviatt, and S. L. Northby.
Available from the National Technical Information Service as COM73-11303 $1.00 in paper copy, $1.45 in microfiche. Marine Technical Report Series No. 5, 1973. 20 p, 15 fig, 13 tab, 38 ref.

Descriptors: *Marinas, *Salt marshes, *Productivity, *Respiration, *Ecology, *Rhode Island, Marsh plants, Nutrients, Suspended solids, Phytoplankton, Organic matter, Copper, Sediments, Biomass, Water quality, Metabolism, Estuaries, Dissolved oxygen, Water analysis, Fouling, Marine algae, Standing crops, Chemical analysis, Plant tissues, Biological communities, Dissolved solids, Water sampling, Duirnal, Toxicity, Distribution patterns, Detritus.
Identifiers: Species diversity, Species abundance, Animal tissues, Wickford Harbor(R.I), Coves, *Narragansett Bay(R.I), Mummichogs, Menhaden, Chlorophyll a, Particulate matter, Marsh grass, Mill Creek, Fecal coliforms, Dissolved organic matter, Atlantic silverside, Grass shrimp, Barnacles, Tunicates, Sponges, Coelenterates, Polychaetes, Ectoprocts.

In Wickford Harbor, Rhode Island, a yacht marina area and a salt marsh cove were considered as ecological systems and compared to evaluate biological populations and magnitudes of production and respiration. Volume and flushing characteristics of both areas were similar. Analyses were made in each cove on marsh grass production, suspended particulate matter, phytoplankton, nutrients, bacteria, dissolved organics, copper levels, fish and sediments. Biomass and metabolim measurements were made on the fouling communities present on floats and pilings in the marinas. Preliminary bioassays were performed with concentrations of outboard motor exhaust water on several species of estuarine organisms. Some additional comparative measurements were taken inside and outside other marinas located in Narragansett Bay. No major differences were found in marsh grass production, concentrations of suspended particulate matter, nutrients, bacteria, dissolved organics, infauna, or sediment metabolism. Copper levels, while lower than toxic concentrations reported in the literature, were higher in the marina cove, ranging from 0.009 microgram in the water to 160 micrograms in the fouling community. Fish species reached the same levels of diversity in both the marina and the marsh cove, but abundance was greater in the marsh cove due to the presence of dense juvenile menhaden schools. The fouling communities of the marinas, which appear to be a food source for juvenile mummichogs (Fundulus heteroclitus), exerted a significant oxygen demand on the marina cove. Diurnal curves of dissolved oxygen showed lower concentrations at the end of the night in marina areas than in adjacent waters. For this reason, and because preliminary bioassays indicated some toxicity due to exhaust waters, it is suggested that marina sites be well flushed with oxygenated tidal waters. The luxurious fouling growths which developed in the marina cove may serve as additional food sources to complement the detritus input from the sal marsh. In most respects the marina cove and th marsh cove appeared to be not only similar, bu also compatible ecological systems. (Mortland Battelle)
W74-06074

PLANKTON PIGMENT HETEROGENEITY I SEVEN RESERVOIRS OF THE LOWE COLORADO BASIN,
Arizona State Univ., Tempe.
D. E. Portz.
Available from the National Technical Informa tion Service as COM-73-11306; for $11.25 in pape copy, $1.45 in microfiche. Report No NOAA 73073008, June 1973. 184 p.

Descriptors: *Plankton, *Pigments, *Reservoirs *Colorado River Basin, Temporal distribution Spatial distribution, Colorado River, Light, Ligh penetration, Turbidity, Environment, Climatolo gy, Water sampling, Stratification, *Southwes U.S., Ecology, Surface waters.
Identifiers: *Salt River.

An examination of spatial and tempor heterogeneities of seven plankton pigments wa made in two reservoir systems of the Salt an Colorado rivers in Southwestern USA. The mai approach developed from a micro- to macro-scal of variation using both profile and surface sam ples. The analysis commenced with inter-sampl differences at differences at fixed locations, fo lowed by intra- and inter-reservoir variation based on constant transect locations. Replicat samples from surface waters exhibited the mo fluctuation in pigment concentration. Profile were most irregular during periods of lake stratif cation. Distance between sampling stations an temporal factors, plus innate characteristics c local water masses contributed to variations withi and among reservoirs. A final comparison c grouped data from the two reservoir systen yielded considerable homogeneity and interrel tionships of pigments were similar for both profi and surface samples in the two systems. Temper ture, percentage light penetration, and turbidi were determined to be most important in influen ing pigment distribution. (Holoman-Battelle)
W74-06078

ENRICHING EFFECTS OF URBAN RUNOF ON THE PRODUCTIVITY OF MESOTROPHIC LAKE,
Washington Univ., Seattle. Dept. of Civil E gineering.
R. M. Emery, C. E. Moon, and E. B. Welch.
Water Research Vol 7, No 10, p 1505-1516, O tober 1973. 4 fig, 4 tab, 15 ref.

Descriptors: *Urban runoff, *Primary productiv ty, *Lakes, *Mesotrophy, *Water pollution e fects, *Eutrophication, Aquatic algae, Nutrient Growth rates, On-site tests, Laboratory test Phytoplankton, Phosphorus, Nitroge Periphyton, Biomass, Radioactivity technique Fluorometry, *Washington, Trophic leve Watersheds(Basins), Streams, Silica, Carbon, A kalinity, Hydrogen ion concentration, Water qual ty, Chlorophyll.
Identifiers: *Lake Sammamsh(Wash), Batch cu tures.

Sewage was diverted from Lake Sammamish September, 1968, and since then there have bee no significant responses by trophic indicato which indicate the lake is beginning to recover. T explain this delay in response, extensive urb development in the lake's watershed was co sidered as a factor which might be acting to inhib the lake's recovery. In vitro uni-algal experimen with water from 13 streams which drain urban ar undeveloped areas showed that about half of t streams stimulated algal growth significantly, b these streams constitute less than 14 percent of t lake's total water income. Of these six strean

nly two drain urban areas and account for less han 2 percent of the water income. In situ experiments showed that no streams were significantly timulatory to natural populations of phytoplankton. Other in situ studies showed that one urban tream and two from undeveloped areas caused ubstantial increases in periphyton growth after a 2-day period, although these increases were not tatistically significant. Additional in situ nutrient imitation experiments in August Of 1970-1971 evealed that P and N were limiting only in combination. Results from these studies do not support he contention that urban runoff is seriously enriching the limnetic region of Lake Sammamish. Mortland-Battelle)
W74-06080

SOME CHARACTERISTICS OF AN OSCILLATORIA-DOMINATED METALIMNETIC PHYTOPLANKTON COMMUNITY,
Allegheny Coll., Meadville, Pa. Dept. of Biology.
. R. Wohler, and R. T. Hartmann.
The Ohio Journal of Science, Vol 73, No 5, p 297-307, September 1973. 4 fig, 4 tab, 27 ref.

Descriptors: *Cyanophyta, *Lakes, *Biological communities, *Dominant organisms, Phytoplankton, Biological properties, Photosynthesis, Light intensity, Water quality, Dissolved oxygen, Carbon dioxide, Phosphates, Chlorophyll, Primary productivity, Radioactivity techniques, Stratification, Distribution patterns, Aquatic productivity, Light, Calcium, Iron, Manganese, Zinc, Seston, *Pennsylvania, Nutrients, Chemical analysis, Alkalinity.
Identifiers: Oscillatoria agardhii, Sample preservation, *Crystal Lake(Penn), Standard Methods.

Crystal Lake, located in Crawford County, Pennsylvania, is a small dimictic lake which during summer stratification contains a large population of Oscillatoria agardhii var. isothrix Skuja in the metalimnetic region. Carbon fixation measurements indicate that this Oscillatoria-dominated community is capable of relatively rapid rates of photosynthesis at low levels of illumination. Analyses of dissolved oxygen, carbon dioxide, phosphate, calcium, iron, manganese, phosphorus, zinc, and chlorophyll a were made on water and seston samples from a vertical water column increased availability of trace nutrients may be involved in the occurrence of the Oscillatoria-dominated community. (Mortland-Battelle)
W74-06081

LIGHT INTENSITY AND PHOTOSYNTHETIC RATES IN PHYTOPLANKTON,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
. P. Harris, and J. N. A. Lott.
Journal of the Fisheries Research Board of Canada, Vol 30, No 12, Part 1, p 1771-1778, December 1973. 8 fig, 12 ref.

Descriptors: *Light intensity, *Phytoplankton, Physiological ecology, *Environmental effects, Inhibition, Respiration, Photosynthetic oxygen, Diatoms, Plant physiology, Photosynthesis, Chlorophyll, Lake Ontario, Aquatic algae, Chlorella, Sampling.
Identifiers: *Photosynthetic rates, Oxygen evaluation, Desmids, Sample preservation, Cell counts, Scenedesmus quadricauda, Chlorella ellipsoidea, Asterionella, Melosira, Asterionella, Cosmarium botrytis.

The physiological behavior of various phytoplankton species has been examined under increasing and decreasing light regimes. A marked asymmetry has been found, with photosynthesis rates under rising light intensities exceeding those under dimming lights. Photoinhibition has been observed at moderate light intensities (0.4-1.0 ly/min). Variations in the asymmetry and in photoinhibition appear to be correlated with the light regimes experienced by the population. Under constant illumination by full sunlight a steady decrease in the photosynthesis rate was observed. As a result of photosynthesis measurements in fluctuating light regimes there is not evidence for photorespiration as the controlling mechanism. Data are presented which show that prolonged exposure to high light has an adverse effect on photosynthesis and indicate that C-14 moored bottle experiments may show reduced surface rates because of this. (Holoman-Battelle)
W74-06082

DIEL AND ANNUAL CYCLES OF NET PLANKTON PHOTOSYNTHESIS IN LAKE ONTARIO,
McMaster Univ., Hamilton (Ontario). Dept. of Biology.
G. P. Harris.
Journal of the Fisheries Research Board of Canada, Vol 30, No 12, Part 1, p 1779-1787, December 1973. 12 fig, 1 tab, 17 ref.

Descriptors: *Photosynthesis, *Phytoplankton, *Measurement, *Lake Ontario, *Nannoplakton, *Biorythms, Hysteresis, Respiration, Diatoms, Water temperature, Radioactivity techniques, Chlorophyta, Chrysophyta, Light intensity, Cycles, Primary productivity, Aquatic algae.
Identifiers: Photosynthetic rates, Desmids, Diel periodicity, Seasonal variation, Respiration rates, Melosira, Asterionella, Tabellaria, Fragilaria, Photoinhibition, Pediastrum, Ceratium, Staurastrum, Recovery.

Photosynthesis measurements on net plankton have been carried out for the period April, 1972 to January, 1973 in Lake Ontario. The rising and falling light regimes used on the net phytoplankton (greater than 64 microns) give marked photosynthetic hysteresis effects in winter and in spring for diatom-dominated populations. Diel fluctuations in photosynthesis and 'sun' or 'shade' adaptations showed a close interaction between the phytoplankton and the surface light intensity. Systematic seasonal changes have been recorded in the magnitude of the photosynthetic hysteresis effect, saturation light intensities, compensation points, maximum photosynthesis, and respiration rates. An inverse correlation has been found between net plankton mean maximum photosynthesis rates and the rate of change of water temperature. Also phytoplankton respiration rate is largely a function of temperature. The data have been unified to give a picture of daily photosynthesis patterns at different depths in a static water column. The data compare well with C-14 moored bottle experiments. Predictive equations have been calculated for maximum photosynthesis rates at different times of the year. (Holoman-Battelle)
W74-06083

CRAWLING AND RESPIRATION AS INDICES OF SUBLETHAL EFFECTS OF OIL AND A DISPERSANT ON AN INTERTIDAL SNAIL LITTORINA LITTOREA,
Bedford Inst., Dartmouth (Nova Scotia).
B. T. Hargrave, and C. P. Newcombe.
Journal of the Fisheries Research Board of Canada, Vol 30, No 12, Part 1, p 1789-1791, December 1973. 2 fig, 3 tab, 6 ref.

Descriptors: *Animal physiology, Physiological ecology, *Oil wastes, *Toxicity, *Snails, Animal behavior, Respiration, Movement, Intertidal areas, Mollusks, *Water pollution effects, Invertebrates, Absorption, Dissolved oxygen.
Identifiers: *Oil dispersants, Littorina littorea, Bunker C oil, Corexit 8666, Oxygen consumption, Crude oil, Respiration rates, Macroinvertebrates.

The present study indexes sublethal effects of oil and a low toxicity dispersant on an intertidal snail, Littorina littorea, by measurement of changes in crawling and respiration rates. Certain variables which might affect toxicity are considered in an attempt to assess the sensitivity of these measures of sublethal effects. Crawling and respiration rates were increased in the presence of Bunker C oil and decreased with brief exposure to a low toxicity dispersant (Corexit 8666) in seawater at 20 C. The addition of the dispersant to an oil seawater mixture also decreases both crawling and respiration. Behavioral traints, such as crawling, and physiological indices, such as respiration, may be sensitive measures of sublethal effects of pollutants on organisms. (Holoman-Battelle)
W74-06084

CAPTAIN TOXICITY TO FATHEAD MINNOWS (PIMEPHALES PROMELAS), BLUEGILLS (LEPOMIS MACROCHIRUS), AND BROOK TROUT (SALVELINUS FONTINALIS),
National Water Quality Lab., Duluth, Minn.
R. O. Hermanutz, L. H. Mueller, and K. D. Kempfert.
Journal of the Fisheries Research Board of Canada, Vol 30, No 12, Part 1, p 1811-1817, December 1973. 4 tab, 15 ref.

Descriptors: *Pesticide toxicity, *Minnows, *Brook trout, *Sunfishes, Animal growth, Fish reproduction, Water pollution effects, Bioassay, Fungicides, Fish physiology, Testing procedures, Viability, Fecundity, Freshwater fish, Chlorinated hydrocarbon pesticides, Laboratory tests, Embryonic growth stage, Juvenile growth stage, Fry, Fish eggs.
Identifiers: *Fathead minnow, Survival, *Captain, Lepomis macrochirus, Pimephales promelas, Salvelinus fontinalis, Continuous flow system, Hatchability, Median tolerance limit.

The toxic effect of captan on survival, growth, and reproduction of fathead minnows (Pimephales promelas) and on survival of bluegills (Lepomis macrochirus) and brook trout (Salvelinus fontinalis) were determined in a flow-through system. In a 45-week exposure of fathead minnows, survival and growth were adversely affected at 39.5 micrograms/liter. Adverse effects on spawning were suspected but not statistically demonstrated at 39.5 and 16.5 micrograms/liter. The maximum acceptable toxicant concentration (MATC), based on survival and growth, lies between 39.5 and 16.5 micrograms/liter, resulting in an application factor (MATC/LTC) between 0.26 and 0.62. LTC values for the bluegill and brook trout were 72 and 27 micrograms/liter, respectively. The estimated MATC is between 44.6 and 18.7 microgrsms/liter for the bluegill and between 18.0 and 7.5 micrograms/liter for the brook trout. The half-life of captan in Lake Superior water with a pH of 7.6 is about 7 hr at 12C and about 1 hr at 25C. Breakdown products from an initial 550 micrograms/liter of captan were not lethal to 3-month-old fathead minnows. (Holoman-Battelle)
W74-06085

INFLUENCE OF SALINITY ON PROTEIN REQUIREMENTS OF RAINBOW TROUT (SALMO GAIRDNERI) FINGERLINGS,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
I. H. Zeitoun, J. E. Halver, D. E. Ullrey, and P. I. Tack.
Journal of the Fisheries Research Board of Canada, Vol 30, No 12, Part 1, p 1867-1873, December 1973. 2 fig, 5 tab, 24 ref.

Descriptors: *Nutrient requirements, Environmental effects, *Salinity, *Proteins, *Rainbow trout, *Juvenile fish, *Fish diets, Fry, Mortality, Stress, Vitamins, Mineralogy.
Identifiers: Salmo gairdneri.

Rainbow trout (Salmo gairdneri) juveniles maintained at 10 and 20 ppt salinity were fed seven diet treatments from 30 to 60 percent protein in 5 percent increments for 10 weeks. The fish were stocked in cones, initially 50 fish per cone. Biweekly weights of diets and fish were determined and mortality was recorded daily. Percent-

age weight gain, gross diet efficiency, and protein efficiency ratio (P.E.R.) were computed. The minimum protein levels required for fish to achieve highest performance using these criteria were 40 and 45 percent for those maintained at 10 and 20 ppt, respectively. Mortality was significantly (P less than 0.05) higher for fish maintained at the higher salinity. Analyses of the fish carcasses were conducted at the beginning and end of the experiment on representative samples to estimate the grams protein retained and apparent net protein utilization (N.P.U.) to verify the above findings. All the available data showed that dietary protein was of major consequence on all measurements until the minimum required level of protein in the diet was reached, while salinity was of minor consequence. P.E.R. and apparent N.P.U. were 2.10 and 34.4, respectively, for casein diets at the 40 percent protein level. (Holoman-Battelle)
W74-06086

CHANGES IN PERIPHYTIC ALGAE FOLLOWING BICARBONATE ADDITIONS TO A SMALL STREAM,
Ottawa Univ. (Ontario). Dept. of Biology.
M. Dickman.
Journal of the Fisheries Research Board of Canada, Vol 30, No 12, Pt. 1, p 1882-1884, December 1973. 1 fig, 6 ref.

Descriptors: *Sessile algae, *Periphyton, Streams, *Growth rates, *Water pollution effects, Standing crops, Plant growth, Detergents, *Carbonates, Water quality, Oligochaetes, Alkalinity, Aquatic algae, *Bicarbonates, *Sodium compounds, Cyanophyta, Chlorophyta, Canada, Hardness(Water), Calcium, Dissolved oxygen, Nitrogen, Nitrates, Phosphates, Hydrogen ion concentration, Chrysophyta, Caddisflies, Diatoms, Biomass.
Identifiers: Sodium bicarbonate, Trichoptera.

Because a number of detergent manufacturers are contemplating substituting carbonate or bicarbonate derivatives for detergent phosphate a study of the effects of bicarbonate on attached algae in a small stream was undertaken. Additions of less than 50 mg/liter sodium bicarbonate significantly increased algal standing crop on glass slides exposed in the treated portion of a small stream during a 2-month period. Filamentous green algae dominated the periphyton community of both bicarbonate treated and control slides when the study was terminated after 63 days. A slight shift in species composition toward the Cyanophycea on the bicarbonate treated slides was also noted. Periphyton biomass increased continuously for the first 3 weeks and this increase was slightly more rapid on the treated slides. After the 4th week, biomass suddenly declined due to a dense 'infestation' of the oligochaete, Stylaria lacustris which often contained algal cells, largely diatoms, in its gut. As the filamentous green algae began to dominate the community on the slides, the number of Stylaria decreased. By the end of the 2nd month a trichopteran larva, Lepidostoma sp., became abundant and algal standing crop again sharply dropped. It dropped more precipitously on the treated slides during these infestations due to higher invertebrate densities there. (Mortland-Battelle)
W74-06087

THE HETEROTROPHIC CAPABILITIES OF CYCLOTELLA MENEGHINIANA,
Hartford Univ., Conn. Dept. of Biology.
J. C. Lylis, and F. R. Trainor.
Journal of Phycology, Vol 9, No 4, p 365-369, December 1973. 4 tab, 21 ref.

Descriptors: *Cultures, *Diatoms, *Light intensity, *Nutrient requirements, *Absorption, Bioassay, Organic matter, Growth rates, Diurnal.
Identifiers: *Heterotrophy, Cyclotella meneghiniana, Pinnularia, Eunotia, Gomphonema parvulum, Navicula motha, Nitzschia palea, Glucose, Culture media, Substrate utilization.

Studies were conducted to determine which organic compounds would support the growth of freshwater diatoms and to determine under what light conditions such organic compounds would support growth. Twenty-five compounds were tested with Cyclotella meneghiniana, Pinnularia sp., Eunotia sp., Gomphonema parvulum, Navicula motha, and Nitzschia palea. Pinnularia grew in the dark when glucose or fructose was added. Eunotia, Gomphonema, Navicula, and Nitzschia did not grow heterotrophically. Cyclotella meneghiniana grew heterotrophically in darkness when glucose in concentrations from 5 mg/liter to 10 g/liter was provided. The other compounds tested did not support growth. However, in continuous light (300 ft-c) growth was not enhanced if glucose was provided. Under diurnal conditions of light (300 ft-c) approximately 12-14 hr of darkness were required to observe the enhancement effects of glucose. Uptake studies with labeled glucose indicated that uptake is not dependent on glucose, but that it occurs only at low light intensities. Cells required 12-14 hr of darkness to develop the uptake system. (Little-Battelle)
W74-06090

EFFECTS OF EGG CONCENTRATIONS OF DDT AND DIELDRIN ON DEVELOPMENT IN WINTER FLOUNDER (PSEUDOPLEURONECTES AMERICANUS),
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
R. M. Smith, and C. F. Cole.
Journal of the Fisheries Research Board of Canada, Vol 30, No 12, Part 1, p 1894-1898, December 1973. 1 fig, 1 tab, 8 ref.

Descriptors: *Water pollution effects, *Fish eggs, *DDT, *Dieldrin, Bioassay, Mortality, Pesticide residues, Pesticide toxicity, Fish reproduction, Fish physiology, Marine fish, Insecticides, Chlorinated hydrocarbon pesticides, Lethal limit, Laboratory tests, Animal pathology, Fish diseases, Fertilization, Chemical analysis.
Identifiers: *Winter flounder, *Embryonic development, Chemical concentration, Pseudopleuronectes americanus.

Abnormal gastrulation and a high incidence (mean equals 39 percent) of vertebral deformities at hatching were encountered in developing eggs from winter flounder, Pseudopleuronectes americanus, experimentally exposed as adults to sublethal concentrations of DDT. Bone erosion and hemorrhaging at the vertebral junctures were often observed in conjunction with the vertebral deformities. No abnormal gastrulation and a lower incidence (mean less than 1 percent) of vertebral deformities without bone erosion and hemorrhaging were encountered in controls. DDT concentrations in the eggs ranged from 0.39 to 4.60 (mean equals 2.42 ppm) compared to 0.11-0.57 ppm (mean equals 0.22 ppm) in the eggs from control flounder. No observable effect on development was noted in eggs from adults exposed experimentally only to dieldrin except in two lots of eggs most of which were dead and necrotic at spawning and contained 1.74 and 1.21 ppm dieldrin. No direct effect on fertilization mortality was due to gamete concentrations of DDT and dieldrin and no residues of either insecticide were detected in the milt from exposed or control male flounder. (Holoman-Battelle)
W74-06091

A PRELIMINARY NOTE ON THE SEQUENTIAL DECOMPOSITION OF PECTIN BY AQUATIC BACTERIA,
Freiburg Univ. (West Germany). Limnologisches Institut.
For primary bibliographic entry see Field 5B.
W74-06092

THERMAL DEATH OF A HYDROCARBON BACTERIUM IN A NONAQUEOUS FLUID,
Florida State Univ., Tallahassee. Dept. of Oceanography.
M. M. Severance, and P. A. LaRock.
Journal of Bacteriology, Vol 116, No 3, p 1287-1292, December 1973. 4 fig, 1 tab, 14 ref.

Descriptors: *Thermal stress, *Temperature, Age, *Bacteria, Aqueous solutions, Cultures, Aging(Biological), Lipids, Laboratory tests, Testing procedures, Mortality, *Oil-water interfaces.
Identifiers: *Hydrocarbon-oxidizing bacteria, Survival, Brevibacterium, Enumeration, Hexadecane, Octanol, Mineral oil, Octane, Dodecane, Kerosene.

A hydrocarbon-utilizing Brevibacterium which grew into the oil phase of an oil-water system was tested for survival at elevated temperature. Cells suspended in oil and cells that had been resuspended in aqueous solution were tested by placing 1-ml samples of the cell suspension in small test tubes immersed in a controlled-temperature water bath. The resultant survival curves in oil consisted of two parts, a flat shoulder obtained in the first half of the heating period, followed by a break indicating rapid die-off. The break in the curves occurred after 50 percent of the cells were killed. This occurred at exposures of 25, 14, and 8 min for 78, 88.6, and 96.2 C, respectively. The survival curve for 63.5 C in the aqueous solution was a rapid, exponential die-off. The actual increase in survival of the organism in oil reflected by the length of the shoulder portion. The shoulder occurs only in an oil medium and is increased by decreasing temperature and increasing age of the culture. (Holoman-Battelle)
W74-06098

CRITERIA FOR ESTIMATING LIMITING NUTRIENTS IN NATURAL STREAMS,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
J. C. O'Shaughnessy, and A. J. McDonnell.
Available from the National Technical Information Service as PB-230 705; $7.75 in paper copy, $1.45 in microfiche. Pennsylvania Institute for Research on Land and Water Resources, University Park, Research Publication 75. December, 1973. 91 p, 24 fig, 7 tab, 57 ref. OWRR A-020-PA(2). 14-31-0001-4038.

Descriptors: *Eutrophication, Nutrients, Aquatic plants, Aquatic algae, *Phosphorus, *Nitrogen, *Bioassays, Sediments, Water pollution, Water quality standards, *Algae, Absorption.
Identifiers: *Nutrient limits, *Macrophytes.

The aquatic macrophytes Elodea canadensis and Potamogeton crispus, Callitriche sp.; and the algae Cladophora sp., Nitella flexilis, Oscillatoria sp., and Microspora sp. were tested for their NH+ -N absorption rate, alkaline phosphatase enzyme activity, extractable surplus phosphorus content, and nitrogen and phosphorus tissue content. Comparisons of the nutritional level of the test species were made with corresponding levels of nitrogen and phosphorus monitored in streamwater, adsorbed on stream sediments, and in the interstitial water of the sediments. Corrsponding laboratory cultures were maintained with media sufficient or depleted in nutrients. Study sites selected included stream segments receiving both natural and man derived inputs of nutrients and included levels of phosphorus ranging from low baseline concentrations to high levels imparted by discharges from secondary sewage treatment plant effluents. Nitrogen depression for the samples studied occurred at ammonium uptake rates ranging from 15 to 40 mg NH4+ -N/10 mg plant material/hr. Severe phosphorus limitation was exhibited at levels of extractable surplus phosphorus less than 0.06 to 0.08 mg PO4-P/100 mg plant material; with cellular phosphorus contents less than 0.13 to 0.20 percent and alkaline phosphatase enzyme activities greater than 1,000 enzyme units/mg plant material. Algae became phosphorus limited at streamwater soluble orthophosphate concentrations of less than 0.01 mg PO4-P/l. Aquatic macrophytes, using sediment interstitial water phosphorus as their primary

nutrient source, did not exhibit similar limitations at these levels.
W74-06105

THE BIOLOGY OF GAMMARUS (CRUSTACEA, AMPHIPODA) IN THE NORTHWESTERN ATLANTIC, VII. THE DURATION OF EMBRYONIC DEVELOPMENT IN FIVE SPECIES AT VARIOUS TEMPERATURES,
Memorial Univ. of Newfoundland, St. John's. Dept. of Biology.
D. H. Steele, and V. J. Steele.
Canadian Journal of Zoology, Vol 51, No 9, p 995-999, September 1973. 2 fig, 2 tab, 17 ref.

Descriptors: *Water temperature, Animal growth, Time, *Thermal stress, Life cycles, *Embryonic growth stage, *Reproduction, Amphipoda, *Crustaceans, Life history studies, Biology, Atlantic Ocean.
Identifiers: Embryonic development, *Gammarus, Beach fleas.

The duration of embryonic development in Gammarus duebeni, obtusatus, setosus, lawrencianus, and oceanicus at various temperatures was found to be related to the reproductive cycle. Slowest development at any temperature occurs in G. setosus, which breeds in September and whose young hatch in the next spring; G. duebeni, obtusatus, and oceanicus mate in late autumn and their young are hatched in the next spring; they have a faster rate of development. G. lawrencianus has the fastest rate of development at any temperature; it breeds in January and the young hatch in the spring. The rate of development is correlated with the size of egg. (Holoman-Battelle)
W74-06120

INTERACTIONS BETWEEN DDT AND RIVER FUNGI. II. INFLUENCE OF CULTURE CONDITIONS ON THE COMPATIBILITY OF FUNGI AND P,P'-DDT,
Leicester Polytechnic (England). School of Biology.
M. Hodkinson, and S. A. Dalton.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 6, p 356-359, December 1973. 2 tab, 9 ref.

Descriptors: *Fungi, *Bioassay, *Cultures, *DDT, *Growth rates, Pesticide toxicity, Water pollution effects.

Saprolegnia sp., Isoachlya monilifera, Isoachlya sp., Pythium sp., Clavariopsis aquatica, Heliscus submersus, Tetracladium setigerum, Varicosporium elodeae, Auroebasidium pullulans, Cephalosporium acremonium, Cladosporium cladosporioides, and Cylindrocarpon orthosporium were cultured in orbital shakers to study the interaction of DDT with the fungi and the influence of culture conditions on their compatibility. Samples were cultured from 24-1600 hrs at 5 or 10C with 2, 10, 20, or 60 micrograms DDT/ml. In general, the growth rates of the twelve fungi were enhanced when the insecticide was included in the basal medium. However, only 50 percent of the fungi were sensitive to 2 micrograms/ml of DDT, and of these, half responded after prolonged incubation. Normally 10 micrograms/ml and higher insecticide concentrations induced marked changes in fungal growth within 2 to 4 days at 20C. Incubation temperatures affected the growth rates of the fungi but did not alter their responses to the insecticide. The growth rate of each fungus increased with increased DDT concentration but the form of the growth curves remained the same. (See also W71-08686) (Little-Battelle)
W74-06123

DISTRIBUTION OF DIELDRIN IN THE TURTLE,
Louisiana State Univ., New Orleans. Dept. of Pharmacology.
For primary bibliographic entry see Field 5A.
W74-06124

PHYSIOLOGICAL RESPONSE OF THE MUD CRAB, EURYPANOPEUS DEPRESSUS TO CADMIUM,
National Marine Fisheries Service, Milford, Conn.
R. S. Collier, J. E. Miller, M. A. Dawson, and F. P. Thurberg.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 6, p 378-383, December 1973. 1 fig, 20 ref.

Descriptors: *Cadmium, *Water pollution effects, *Toxicity, *Lethal limit, Absorption, Mortality, Bioassay, Animal physiology, Oxygen, Laboratory tests.
Identifiers: *Mud crab, *Oxygen consumption, Median tolerance limit.

A study was undertaken to determine the toxicity of acute exposure of cadmium in the mud crab, Eurypanopeus depressus, as evidenced by mortality and by differential oxygen consumption occuring at non-lethal levels of this contaminant. Crabs were exposed to cadmium in one-gallon glass jars, filled to three liters with a synthetic medium prepared using technical-grade chemicals dissolved in fresh well-water and adjusted to 25 ppt salinity. The pH of the seawater remained at 7.0 for the range of cadmium concentrations tested. Analysis of the synthetic medium by an independent testing film indicated that cadmium was present at 0.0045 ppm and that other background metals were negligible. Oxygen consumption measurements were made on whole animals exposed to 0.0, 3.0, 6.0, and 7.0 ppm Cd (10-15 animals per concentration) and on excised gill tissue of animals exposed to 0.0, 4.0, and 7.0 ppm Cd (12 animals per concentration). Oxygen consumption was monitored over a 4-hr period in a Gilson differential respirometer. The LCO, LC50, and LC100 were 1.0 ppm, 4.9 ppm, and 11.0 ppm, respectively, with 95 percent confidence limits for the LC50 being 3.9-5.4 ppm. The oxygen consumption rates of whole animals showed great individual variation, ranging from 35 to 75 microliters oxygen/hr/g. Oxygen consumption rates of the gill tissue alone, however, decreased as the cadmium concentration increased. Because the whole animals exhibited great variations in oxygen consumption rates, no cadmium-induced changes could be detected. These variations were possibly due to differential activity between individual crabs, because they were held unrestrained and free to move about in the reaction vessels. Gill tissue oxygen uptake, however, showed a graded decrease with increasing cadmium, and may reflect tissue pathology. (Mortland-Battelle)
W74-06126

DETERMINATION OF RESIDUES OF MESUROL AND ITS TOXIC METABOLITES IN PLANT AND ANIMAL TISSUES,
Baychem Corp., Kansas City, Mo. Chemagro Div.
For primary bibliographic entry see Field 5A.
W74-06128

OXIDATION-REDUCTION POTENTIAL AND GROWTH OF SALMONELLA AND PSEUDOMONAS FLUORESCENS,
Iowa State Univ., Ames. Dept. of Food Technology.
J. L. Oblinger, and A. A. Kraft.
Journal of Food Science, Vol 38, No 7, p 1108-1112, November/December 1973. 6 fig, 2 tab, 13 ref.

Descriptors: *Oxidation-reduction potential, *Salmonella, *Pseudomonas, *Growth rates, Hydrogen ion concentration, Instrumentation, Measurement, Aeration, Metabolism, Cultures, Aerobic bacteria, Electrodes, Environmental effects, Pathogenic bacteria.
Identifiers: Survival, Enumeration, Agars, Culture media, Bacterial physiology, Serotypes.

An apparatus developed for measurement of changes in Eh, pH, and cell numbers was used to study pure and mixed cultures of Salmonella and Pseudomonas. Six serotypes of Salmonella and three strains of P. fluorescens were used. In all instances, cultures were incubated at the temperature that was to be employed during the experiments (24 hr at 30 and 37 C; 96-120 hr at 15 C) in trypticase soy broth. For pure culture studies at 15, 30 and 37 C, three or more vessels were inoculated with the particular Salmonella or Pseudomonas strain to yield approximately 100-1,000 cells per ml. For mixed cultures studied at 15 and 30 C, four vessels were inoculated with mixtures of selected Salmonella and Pseudomonas strains to yield varying initial ratios of Salmonella to Pseudomonas. During the pure culture investigations, trypticase soy agar (BBL) was used for enumeration of both Salmonella and Pseudomonas. For mixed culture enumeration, surface plating was used. Plates were incubated at either 15, 30 or 37 C, depending on the temperature used for cultivation. There seem to be definite values of Eh that determine if a given organism can initiate growth and/or survive. Measurements of Eh, pH, and growth at 15 C showed that, once the salmonellae investigated had adapted to the somewhat adverse environment, they possessed the capacity of proliferate actively and attain large populations. Moreover, the salmonellae and the Pseudomonas persisted for a longer time at 15 C than at 30 and 37 C. In the mixed culture studied, fewer cells per ml were produced by both the salmonellae and Pseudomonas strains than in pure culture. (Mortland-Battelle)
W74-06134

POSSIBLE MICROBIAL CONTRIBUTION TO NITROSAMINE FORMATION IN SEWAGE AND SOIL,
International Inst. of Tropical Agriculture, Ibadan (Nigeria).
For primary bibliographic entry see Field 5B.
W74-06136

THE TOXICITY OF MIXTURES OF METALS AND SURFACTANTS TO RAINBOW TROUT (SALMO GAIRDNERI RICH.),
Istituto di Ricerca sulle Acque, Milan (Italy). Sezione Idrobiologia Applicata.
D. Calamari, and R. Marchetti.
Water Research, Vol 7, No 10, p 1453-1464, October 1973. 5 fig, 2 tab, 45 ref.

Descriptors: *Rainbow trout, *Toxicity, *Copper, *Mercury, *Detergents, *Water pollution effects, Mortality, Surface tension, Alkylbenzene sulfonates, Linear alkylate sulfonates, Lethal limit, Bioassay, Surfactants.
Identifiers: *Animal tissues, Nonylphenol ethoxylate, Synergistic effects, Standard Methods, Blood, Liver, Kidneys, Gills, Biological samples, Anionic detergents, Nonionic detergents, Mixtures.

The toxicity to rainbow trout of two metals (copper and mercury) and three detergents (two anionics and one non-ionic) were determined with an exposure period of 14 days. Each compound was tested separately and as a metal-detergent pair. The apparatus used for determining the toxicity of the mixtures semicontinuously changes the solution in the tank containing the fish. Ten randomly selected rainbow trout, 12-16 cm in length were used at each concentration. Before the experiments the animals were maintained for at least 7 days in running water of the same quality as that of the dilution water used in the test. Mortality was recorded every 3 h for the first 20 h, and then less frequently on successive days. The concentration of the anionic surfactants was checked daily by the methylene-blue method. A suitable analytical method was lacking for non-ionic surfactants (NP), so the volumes of toxic solutions and dilution water dispensed by the dosing apparatus were controlled rigorously. The concentrations of both

copper (cuproethyl method according to Standard Methods, 1960) and mercury (flameless atomic absorption) were checked daily along with the analyses of the other experimental conditions. The results show that for the mixtures of anionic detergents and metals a 'more-than-additive' effect exists, while for the mixture of non-ionic detergent and metal the toxic effect is probably 'less-than-additive'. These findings are compared with existing data in the literature and the underlying reasons for these effects are discussed. (Mortland-Battelle)
W74-06138

POPULATION DYNAMICS OF POND ZOOPLANKTON. II. DAPHNIA AMBIGUA SCOURFIELD,
Kansas State Geological Survey, Lawrence.
E. E. Angino, K. B. Armitage, and B. Saxena.
Hydrobiologia, Vol 42, No 4, p 491-507, September 28, 1973. 1 fig, 4 tab, 48 ref.

Descriptors: *Zooplankton, *Environmental effects, *Population, *Kansas, Daphnia, Density, Statistical methods, Calcium, Nitrites, Ammonia, Iron, Chlorides, Phosphates, Magnesium, Sulfates, Reproduction, Waterfleas, Competition, Water pollution effects, Food abundance, Regression analysis, Strontium, Boron, Zinc, Carbonates, Silicon, Conductivity, Temperature, Bicarbonates, Chlorophyll, Oxygen, Cobalt, Niches, Habitats, Dominant organisms, Biological communities.
Identifiers: Manganese, Ovigerous females, Photoperiod, Chlorophyll a, Data interpretation, *Daphnia ambigua.

Statistical relationships of 27 environmental components with population units of D. ambigua were determined for fifty weeks in a pond in northeastern Kansas. Simultaneous analyses accounted for more variability in total number/l and in the number of ovigerous females/l than did any of the lag analyses; 1-week lag accounted for the greates amount of variability in clutch size. Calcium was the most important variable determining density of Daphnia. Temperature and chlorophyll a (as a measure of food) were relatively unimportant in affecting total number. Other environmental components accounting for at least 2 percent of the variation in no lag were nitrite, ammonia, iron, chloride, phosphate, magnesium, sulfate and manganese. Temperature and boron were the most important variables affecting the number of egg-bearing females/l. Boron, nitrate, chloride, and strontium were the most important variables affecting clutch size. Food apparently affected clutch size in a minor way. The environmental components affect Daphnia ambigua and Diaptomus pallidus in quite different ways. These differences may prevent either species from maintaining dominance and excluding the other and could account for the widespread pattern of co-occurrence of diaptomid and daphnid species. (Mortland-Battelle)
W74-06154

THE POSSIBLE OCCURRENCE OF PHOTOSYNTHETIC MICROORGANISMS IN DEEP-SEA SEDIMENTS OF THE NORTH ATLANTIC,
City Coll., New York.
For primary bibliographic entry see Field 5B.
W74-06155

LUXURY UPTAKE OF PHOSPHATE BY ACTIVATED SLUDGE,
Notre Dame Univ., Ind. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-06157

MUSSELS AND INDICATORS OF BIOLOGICAL RECOVERY ZONE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
G. M. Simmons, Jr., and J. R. Reed, Jr.
Journal Water Pollution Control Federation, Vol 45, No 12, p 2480-2492, December 1973. 9 fig, 2 tab, 36 ref.

Descriptors: *Water pollution effects, *Bioindicators, *Acid mine water, *Mussels, Water analysis, Mine drainage, *Virginia, Water quality, Flow rates, Dissolved oxygen, Hydrogen ion concentration, Scuba diving, Sampling, Water temperature, Dissolved solids, Benthic fauna, Suspended solids, Gastropods, Mayflies, Caddisflies, Stoneflies.
Identifiers: *Species diversity index, North Anna River(Va), Pamunkey River(Va), Recovery, Macroinvertebrates.

A 3-month study was made on the lower North Anna and upper Pamunkey River system in Virginia to locate the biological recovery zone of the North Anna River from the effects of acid mine drainage on Contrary Creek. The study included the collection of physical, chemical, and biological information (macrobenthos and fish). Physical and chemical information did not reveal any differences between water quality in the North Anna and Pamunkey rivers. Aesthetically and chemically speaking, the river recovers very quikly. The waters of the North Anna River below the entrance of Contrary Creek were also suitable for agricultural purposes such as irrigation and livestock watering. The insect portion of the macrobenthic community would indicate that, biologically speaking, the river recovered very quickly. However, if the entire macrobenthic community is considered, the river recovered at the confluence of the North Anna and South Anna rivers, that is, at the beginning of the Pamunkey River. The point of recovery is based on the re-establishment of mussel populations. Diversity indexes, because of the dominance of insect species, did not reveal the recovery zone. It is important, therefore, when one considers problems of this nature, to use as many components of the biological community as possible. Although diversity indexes were unable to show the recovery zone, the Sequential Comparison Index, originally proposed as a tool for nonbiologists, was just as reliable as the diversity index based on Information Theory with regard to placing an index number on a given community in a given location of the river. Scuba diving proved to be a very useful tool. Without this equipment the authors would never have been able to locate the biological recovery zone so precisely. (Little-Battelle)
W74-06158

NUTRIENT-PRODUCTIVITY RELATIONSHIPS IN A BAYOU ESTUARY,
General Electric Co., Bay Saint Louis, Miss. Mississippi Test Support Dept.
R. P. Hannah, A. T. Simmons, and G. A. Moshiri.
Journal Water Pollution Control Federation, Vol 45, No 12, p 2508-2520, December 1973. 11 fig, 2 tab, 29 ref.

Descriptors: *Nutrients, Ammonia, *Nitrites, *Nitrates, *Phosphates, Silts, *Ion exchange, Absorption, *Primary productivity, Limiting factors, Water analysis, Water pollution effects, Light, Water temperature, Salinity, Dissolved oxygen, Photosynthesis, Chemical analysis, Bayous, *Florida, Cycling nutrients, Radioactivity techniques, Phytoplankton, Distribution, Spatial distribution.
Identifiers: *Bayou Texa(Fla), Sample preservation, Buffering, Carpenter's Creek.

The temporal and spatial distribution of nitrogen and phosphorus were studied in Bayou Texa, an estuarine bayou near Pensacola, Fla., as related to the major nutrient source and carbon fixation of the system. Studies were conducted from March 1971 to March 1972. At the time of sampling, light, temperature, salinity, and DO were measured. Water samples were filtered and frozen until analysis for ammonia, nitrite, nitrate, and phosphate. The sediment-water column phosphate exchange was studied by two basic experiments designed to demonstrate the absorption of phosphates on sediment particles and the phosphate buffering capacity of silt particles. Carbon fixation was measured by a modification of the C-14 method. Results showed that Carpenter's Creek was the primary source of all nitrogen forms except nitrite. There was a significant degree of phosphorus exchange between the water and bayou sediments, even though the phosphorus content of the bayou was very low. Carbon fixation rates ranged from 140 mg C/hr/cu m in the early fall to 10 mg C/hr/cu m in the winter. Finally, the tests indicated that the inorganic nitrates were more important than the inorganic phosphates in controlling carbon fixation rates. (Little-Battelle)
W74-06160

PROPERTIES OF GB IN WATER,
Edgewood Arsenal, Aberdeen Proving Ground, Md.
For primary bibliographic entry see Field 5B.
W74-06161

ALUMINUM IN FLUORIDATED DRINKING WATER: ANALYTICAL AND PHYSIOLOGICAL PROBLEMS,
Institute of Dental Research, Praque (Czechoslovakia). Chemical Dept.
For primary bibliographic entry see Field 5A.
W74-06164

RESPONSE OF ANABAENA TO PH, CARBON, AND PHOSPHORUS,
Pennsylvania Univ., Philadelphia. Dept. of Civil and Urban Engineering.
J. D. Keenan.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 99, No EE5, p 607-620, October 1973. 6 fig, 4 tab, 37 ref.

Descriptors: *Carbon, *Phosphorus, *Eutrophication, *Anabaena, *Hydrogen ion concentration, Water quality, Phosphates, Photosynthesis, Respiration, Cultures, Manometers, Statistical methods, Bioassay, Aquatic algae.
Identifiers: *Orthophosphates, Factorial analysis, Culture media.

The objectives were to study roles of carbon and phosphorus in cultural eutrophication, and to investigate the observation that blue-green algal blooms are frequently associated with a pH greater than 8.4. These objectives were met by the manometric determination of rates of photosynthesis and respiration in the blue-green alga, Anabaena flos-aquae as functions of pH, total inorganic carbon, and orthophosphate. The photosynthetic rate was independent of carbon concentrations from 30 ppm Na2CO3-300 ppm Na2Co3. At pH values of 8.3 or less, photosynthetic rate is dependent upon pH and independent of P concentration. At higher pH values, the reverse is true. Respiration was independent of pH, carbon, and phosphorus. The association of blue-greens with alkaline pH values is related to an H(plus) effect and is independent of the ionic forms of carbon and phosphorus. (Mortland-Battelle)
W74-06165

CARBON AND NITROGEN AS REGULATORS OF ALGAL GROWTH,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
E. G. Foree, and C. R. Scroggin.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil

Engineers, Vol 99, No EE5, p 639-652, October 1973. 9 fig, 3 tab, 15 ref, 2 append.

Descriptors: *Carbon, *Nitrogen, *Growth rates, Limiting factors, *Plant growth regulators, *Aquatic algae, *Algal control, Anabaena, Chlorella, Chlamydomonas, Cladophora, Nutrients, Phosphorus, Chemical oxygen demand, Ammonia, Nitrogen fixation, Sewage sludge, Absorption, Water quality, Incubation, Hydrogen, Oxygen, Carbon dioxide, Sewage effluents.
Identifiers: Continuous cultures, Anacystis, Batch cultures.

Continuous flow algal cultures were grown under three different growth conditions using secondary sewage treatment plant effluent as the growth medium. The only variable within each run was the hydraulic residence time. The concentrations of growth regulating nutrients were varied between the runs so that comparisons of the algal mass, composition, nutrient uptake, and genera could be made. The importance of CO2 availability for algal growth was also studied. The second phase of the study was a batch culture study in which the same growth medium was used as in Phase 1. The objective of Phase 2 was to investigate significant similarities and differences between continuous and batch culture growth under otherwise similar growth conditions. Carbon dioxide enriched conditions produced as much as 10 times the algal mass as CO2 deficient conditions. Algal blooms dominated by blue-green algae were found to be the result of a successional change from green to blue-green algae under CO2 enriched, nitrogen limited conditions. In the batch culture study algae exhibited a luxuriant nitrogen uptake. (Mortland-Battelle)
W74-06166

OYSTERS: RETENTION AND EXCRETION OF THREE TYPES OF HUMAN WATERBORNE DISEASE BACTERIA,
Army Medical Research Inst. of Infectious Diseases, Frederick, Md.
W. A. Janssen.
Health Laboratory Science, Vol 11, No 1, p 20-24, January 1974. 2 tab, 9 ref.

Descriptors: *Oysters, *Shigella, *Salmonella, *Retention, *Bacteria, Brackish water, Ultraviolet radiation, Human diseases, Water pollution effects, Vectors(Biological), Cultures, Pathogenic bacteria, Self-purification, Enteric bacteria, Aerobic bacteria, Water pollution effects.
Identifiers: *Francisella, *Excretion, Survival, Fecal coliforms, Agars, Culture media, Tularemia, Bacillary dysentery, Gastroenteritis.

Oysters experimentally contamined with bacteria which cause bacillary dysentery (Shigella flexneri), tularemia (Francisella tularensis), or gastroenteritis (Salmonella typhimurium) retained and excreted the organisms for markedly different time periods in artificial brackish water continuously decontaminated by ultraviolet light. Sh. flexneri appeared to be removed within 24 h; excreted organisms were not detected in the aquatic environment. F. tularensis was retained for at least 11 days; excretion of these organisms was detected for 9 days. S. typhimurium persisted in oysters for the entire 49 days of the experiment and were excreted in sufficient numbers to be detected for 14 days. These findings indicate that depuration, or 'self-cleaning', procedures currently in use for commercial oysters based on removal of fecal coliform bacteria within 48 h may be deceptive and ineffective in removing some human waterborne disease organisms. (Mortland-Battelle)
W74-06167

COMPETITIVE GROWTH OF SALMONELLA AND PSEUDOMONADS IN TETRATHIONATE ENRICHMENT BROTH,
Aarhus Univ. (Denmark). Inst. of Hygiene.
A. S. P. Gundstrup.
Health Laboratory Science, Vol 11, No 1, p 25-27, January 1974. 9 ref.

Descriptors: *Salmonella, *Pseudomonas, *Growth rates, *Completion, *Sewage, Cultures, E. coli, Incubation, Isolation, Bioindicators, Aerobic bacteria, Waste water treatment.
Identifiers: *Tetrathionate, Antagonism, Enrichment media, Cylinder-Plate method, Agars, Bacterial physiology, Culture media, Mixed cultures.

Isolation of specific bacteria such as pathogens, indicators of pollution, from mixed flora samples, as sewage and receiving water samples, implies the risk that the saprophytic flora will overgrow them during the enrichment procedure due to antagonism and competition for essential nutrients. As part of a current series of investigations on the occurrence of antagonism in enrichment media, this paper deals with the importance of the frequent occurrence of Pseudomonas aeruginosa in tetrathionate broth used for Salmonella enrichment of sewage receiving water samples. It was shown, by means of the Cylinder-Plate-Method, and by means of simultaneous cultivation of Salmonella and Pseudomonas aeruginosa together in tetrathionate broth, followed by differential counts of the two, that the Pseudomonas did not interfere with Salmonella growth, or vice versa, although E. coli was inhibited to such extent by Pseudomonas that they could not be detected after 24 h incubation. The fact that Salmonella and Pseudomonas are able to develop simultaneously in tetrathionate broth opens the possibility of killing two birds with one stone, namely to isolate both Salmonella and Pseudomonas from e.g., sewage samples by a tetrathionate enrichment followed by a separation of the two bacteria on selective Pseudomonas and Salmonella media respectively. (Mortland-Battelle)
W74-06168

BIOLOGICAL EFFECTS OF FENITROTHION IN THE DIET OF BROOK TROUT,
Fisheries Research Board of Canada, St. Andrews (New Brunswick), Biological Station.
D. J. Wildish, and N. A. Lister.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 6, p 333-339, December 1973. 5 tab, 8 ref.

Descriptors: *Pesticides toxicity, Fish, *Diets, *Brook trout, *Bioassay, *Fish behavior, *Water pollution effects, Insect control, Foods, Secondary productivity, *Canada.
Identifiers: *Fenitrothion, Elimination, Acetylcholinesterase.

Three experiments were conducted to assess the possible effects on brook trout of spraying forests in New Brunswick with fenitrothion to prevent spruce budworm damage. Experiment 1 was to determine the regurgitation threshold of fenitrothion in the diet. Experiment 2 was to determine spontaneous food partitioning by individual fish receiving food with and without fenitrothion added. Experiment 3 was to determine dry weight and acetylcholinesterase activity of the fish used in experiment 2. The threshold for tolerance of fenitrothion in the stomach of brook trout was 376 mg fenitrothion/kg of wet fish weight. Regurgitation occurred 3-24 hr after ingestion. After 4 weeks of feeding 10 mg fenitrothion/g food, the hierarchical pattern of the fish had reversed. Total, but not individual, gross conversion efficiency of food per tank was highest after 4 weeks feeding with 10 mg fenitrothion/g. In Experiment 3 the previously most dominant fish in Experiment 2 regained dominance in the new conditions after 3 weeks. AChE activity values demonstrate that enzyme activities increased to 56 percent from 17 percent that of controls 27 days after exposure to 10 mg fenitrothion/g food. At 1 mg fenitrothion/g food the depression of AChe activity was not associated with behavioural effects. The possibility that aquatic and terrestrial insects killed by fenitrothion may cause lethal or sublethal effects directly in salmonids has been shown to be unlikely. It remains possible that reductions in insect biomass may be of sufficient magnitude and persistence to significantly reduce ration and hence reduce salmonid production. (Little-Battelle)
W74-06169

THE FATE OF DIELDRIN IN A MODEL ECOSYSTEM,
Illinois State Natural History Survey, Urbana.
For primary bibliographic entry see Field 5B.
W74-06170

TEMPERATURE AND THE TOXICITY OF CHROMATE AND ARSENATE TO THE ROTIFER, PHILODINA ROSEOLA,
Northwestern Univ., Evanston, Ill.
E. D. Schaefer, and W. O. Pipes.
Water Research, Vol. 7, No. 12, p 1781-1790, December 1973. 3 fig, 4 tab, 7 ref.

Descriptors: *Rotifers, *Toxicity, *Water temperature, Time, Animal physiology, Bioassay, Water pollution effects, Lethal limit, Growth rates, Invertebrates, Heavy metals, Animal growth, Reproduction.
Identifiers: *Chromates, *Arsenates, Median tolerance limit, Survival, *Philodina roseola, Eggs.

The rotifer, Philodina roseola, was exposed to toxic solutions of chromate and arsenate in a study of the interaction of time, temperature and TL sub m in bioassay procedures. The objective of the study was to determine the form of the time, temperature and toxicity relationships in order to provide a better basis for predicting 'safe' concentrations from short term bioassay data and to illustrate the effect of temperature upon both short term toxicity and 'safe' concentrations. One hundred twenty rotifers were used at each concentration for the short term bioassays. The cultures were placed in incubators held at the desired temperature. The life span bioassays were conducted in the same manner except they were begun with eggs instead of adults. In a lettuce infusion medium all specimens of Philodina roseola were killed in less than 2 days at 40C but some specimens lived long enough to reproduce at 38C. The rate of increase of Philodina roseola increased exponentially with temperature in the range, 15-35C, but its median life span decreases exponentially with temperature in the same range. The data presented support the hypothesis that (1) for short exposure times aquatic organisms can withstand higher concentrations of toxic materials at lower temperatures than at higher temperatures; (2) the longer the exposure time the less the effect of temperature upon the concentration of toxic material which will kill half of the test organisms; and (3) life span TL sub m values are independent of temperature. (Holoman-Battelle)
W74-06172

MOBILIZATION OF SOME METALS IN WATER AND ANIMAL TISSUE BY NTA, EDTA AND TPP,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5B.
W74-06173

APPARATUS FOR CONTROL OF POISON CONCENTRATION IN TOXICITY STUDIES WITH FISH,
Water Pollution Research Lab., Stevenage (England).
F. S. H. Abram.
Water Research, Vol. 7, No. 12, p 1875-1879, December 1973. 4 fig, 1 tab, 8 ref.

Descriptors: *Fish, *Toxicity, *Automatic control, *Measurement, Water pollution effects, Instrumentation, Laboratory equipment, Bioassay,

Automation, Laboratory tests, Research equipment, Poisons.
Identifiers: Dosing apparatus.

In order to facilitate accurate maintenance of defined experimental conditions in studying the effects of water pollutants on fish, automatic apparatus is frequently used. The equipment described here provides an automatic delivery of poison solutions to 14 aquaria; single poisons can be added at constant concentrations or poisons can be mixed or delivered in fluctuating or alternating concentrations. The system used involves the filling and emptying of 500-ml measuring cylinders with water, simultaneously incorporating an appropriate quantity of poison from a concentrated stock-solution. The apparatus consists essentially of 14 perspex aquaria; each of 40-l. capacity, and each equipped with its own dosing unit. Each dosing unit consists of a 500-ml measuring cylinder with three tabulations near the base, the largest of which connects the cylinder to a 10-mm bore kinkingtube valve. The tee-piece of this valve is attached by 'Terry' clips to a duralumin bar which is reciprocated through a distance of one inch by a pneumatic cylinder at timed intervals; hence the measuring cylinder fills and empties with water in accordance with the movement of the bar and discharges its contents into one of the aquaria. The apparatus has been found to work reliably for long periods, with little maintenance apart from routine cleaning, and also with a satisfactory degree of accuracy. (Mortland-Battelle)
W74-06174

INCIDENCE OF, AND BELIEFS ABOUT, ONCHOCERCIASIS IN THE SENEGAL RIVER BASIN,
Central District Control, Bamako (Mali).
P. J. Imperato, and O. Sow.
Trop Geogr Med. Vol 23, No 4, p 385-389, 1971.
Identifiers: Ethnic groups, *Mali Republic(Sevegal River basin), *Onchocerciasis, Rivers, Simulium, Vectors, *Attitudes, *Human diseases(Blindness).

Local beliefs about onchocerciasis were studied among several ethnic groups in that section of the Senegal River basin which lies in the Republic of Mali. Traditionally, the signs and symptoms of the disease were viewed as separate and unrelated entities. Although a certain degree of knowledge exists about the seasonal distribution and biting habits of the vector and the relationship of water courses to blindness incidence, there is no awareness that Simulium flies transmit the disease.--Copyright 1973, Biological Abstracts, Inc.
W74-06231

INLAND WATERS, VOL 16, PART 6. FRESHWATER PHYTOPLANKTON. SYSTEMATICS AND BIOLOGY, (IN GERMAN),
For primary bibliographic entry see Field 2I.
W74-06235

VERTICAL DISTRIBUTION OF TRANSPARENCY IN LAKE BAIKAL AND ITS RELATIONSHIP TO BIOLOGICAL INDICES, (IN GERMAN),
For primary bibliographic entry see Field 2H.
W74-06237

PRELIMINARY RESULTS OF STUDIES ABOUT THE PLANKTON OF THE 'LAGUNA SETUBAL' (SANTA FE, ARGENTINA), (IN SPANISH),
Universidad Nacional del Litoral, Santa Fe (Argentina). Lab. of Radioisotopes.
For primary bibliographic entry see Field 2H.
W74-06238

A BACTERIOLOGICAL STUDY OF THE OYSTER BEDS AND SHELLFISH OF THE LAGOON OF OUALIDIA DURING 1970, (IN FRENCH),
Institut des Peches Maritimes du Maroc, Casablanca.
P. C. Beaubrun.
Bull Inst Peches Marit Maroc. 20 p, 91-108. 1972. Illus.
Identifiers: Bacteriological studies, *Escherichia-Coli, Lagoons, *Morocco(Oualidia Lagoon), *Oyster beds, Pollution, Salinity, Shellfish, Water pollution effects, Water temperature.

The lagoon is a narrow body of water near Safi separated from the sea by a narrow line of sand dunes. Determinations of water temperature, salinity and number of Escherichia coli per liter were made at 3 stations over a 12 mo. period. The main sources of pollution are identified as: the animal manure spread on the tomato fields near the lagoon; a campsite which is fully occupied during the June-Sept. vacation period; fishermen and others who camp along the beach; and from cattle grazing near the lagoon. Some E. coli may also be introduced into the lagoon with oysters planted into the lagoon from contaminated sources. The numbers of E. coli in oysters and mussels were determined throughout the year also. However only on a very small number of exceptional occasions did the coli-form level rise above the 'acceptable' level.--Copyright 1973, Biological Abstracts, Inc.
W74-06252

A PARASITIC SPOROZOAN OF CRASSOSTREA RHIZOPHORAE (GUILDING), (IN FRENCH),
Institut Scientifique et Technique des Peches Maritimes, Nantes (France).
M. Comps, H. Grizel, and G. Tige.
C R Hebd Seances Acad Sci Ser D Sci Nat. Vol 275, No 15, p 1693-1695. 1972. Illus.
Identifiers: *Crassostrea-Rhizophorae, Culture, Digestive glands, French Guiana(Montsinery River), Gills, Histology, Mantle, *Oyster populations, Spat, *Sporozoan parasites.

On the coast of French Guyana, principally in the Montsinery river, natural oyster populations belonging to the species C. rhizophorae occur. Within the framework of oyster culture in Guyana, surveys were conducted on the possible parasites of these oysters which were little studied. This survey involving live and fixed samples made it possible to identify the presence of nematopsidian spores. Histological examination confirmed the localizations. The dissemination of the spores in the oyster involves the phagocytes which carry them into the interstitial conjunctive tissue of the digestive gland of the mantle and branchiae. The spores are individual or grouped within the same cell in 2, 3, or 4. Because the rate of infestation in spat is low, the investigators did not observe any mortality directly or indirectly involving the nematopsidian spores.--Copyright 1973, Biological Abstracts, Inc.
W74-06253

COMPARISON OF THE EPIZOOTOLOGICAL IMPORTANCE OF THE PARASITES OF SALMO GAIRDNERI IRIDEUS IN THE TWO COAST AREAS OF BOSNIA AND HERZEGOVINA,
Slovenska Akademie Vied, Kosice (Czechoslovakia). Helmintologicky Ustav.
R. Zitnan, and M. Cankovic.
Helminthologia (Bratisl). 11 p, 161-166. 1970(1972). Illus.
Identifiers: Azygia-lucii, Coasts, Costia-necatrix, Crowcrocoecum-testiobliquum, Cyathocephalus-truncatus, *Epizootiological studies, Gyrodactylus-salaris, Ichthyophthirius-multifiliis, Metechinorhynchus-salmonis, Metechinorhynchus-truttae, Myxosoma-cerebralis, Octomitus-truttae, Salmo-gairdneri-irideus, Trichodina-sp, *Yugoslavia(Bosnia-Herzegovina), *Salmon parasites.

Parasite species occuring in wild fish and presenting a danger to S. g. iridus in fish breeding farms were discussed. Octomitus truttae, Costia necatrix, Ichthyophthirius multifiliis, Trichodina sp., Myxosoma cerebralis, Gyrodactylus salaris, Crowcrocoecum testiobliquum, Azygia lucii, Cyathocephalus truncatus, Metechinorhynchus salmonis and M. truttae were the epizootologically important parasites.--Copyright 1973, Biological Abstracts, Inc.
W74-06254

PHYSICAL, CHEMICAL, AND BIOLOGICAL CHARACTERISTICS OF CONEWAGO LAKE DRAINAGE BASIN, YORK COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
A. N. Ott, J. L. Barker, and D. J. Growitz.
Pennsylvania Department of Environmental Resources Water Resources Bulletin No 8, August 1973. 96 p, 38 fig, 38 tab, 73 ref, 2 append.

Descriptors: *Lakes, *Pennsylvania, *Eutrophication, Nutrients, Water pollution sources, Reservoirs, Productivity, Limnology, Water pollution effects.
Identifiers: *Conewago Lake(Penn).

The Conewago Lake drainage basin is a small sparsely populated basin in the humid temperate region of the Piedmont Province in south-central Pennsylvania. It contains naturally fertile streams that maintain a moderately enriched manmade lake. The basin, underlain principally by diabase, is 42% forested, and the balance of the area is devoted to nonintensive agriculture. Although electrolyte concentrations differed widely between surface and subsurface waters in the basin, there were only minor differences in the proportions of the major cations in these waters, the diabase, and the soil. A similarity was found in the electrolyte content of the regolith groundwater and low-base streamflow. The small ratio of lake storage to drainage area results in the storage of direct runoff which dilutes the fertile low-base streamflow. This dilution by the lake is sufficient to classify the lake as mesotrophic or moderately enriched. (Knapp-USGS)
W74-06259

ENVIRONMENT, WATER AND SEDIMENTS OF CHRISTIANSTED HARBOR, ST. CROIX,
Caribbean Research Inst., St. Thomas, Virgin Islands.
M. Nichols, D. Grigg, A. Sallenger, R. vanEepoel, and R. Brody.
Virgin Islands Department of Health, Division of Environmental Health Water Pollution Report No 16, May 1973 (2nd printing). 166 p.

Descriptors: *Water pollution effects, *Harbors, *Virgin Islands, *Sedimentation, Erosion, Turbidity, Water pollution, Sewage, Coliforms, Aesthetics, Water quality.
Identifiers: *Christiansted harbor (VI).

At Christiansted, St. Croix, Virgin Islands, development has been historically linked to the harbor. The harbor is used for transportation, its floor is a local source of sand for construction, and its offshore reaches are a source of food. Its shores provide recreational beaches and sites for boat repair and berthing. Most harbor shores are stable. Attractiveness of some beaches is reduced by accumulations of marine grasses, by ledges of beachrock, abandoned boats, and by rubble washed from dredge fill. Erosion is locally active at Turquoise Beach and on shores of unstabilized landfill. Water quality varies from excellent in the western harbor and seaward reaches to poor in the eastern and inner parts. High turbidity is partly introduced by sewage and sediment discharge, but mainly generated by wave erosion of unstabilized

dredge soil. Although tidal exchange is insignificant, waters are rapidly flushed and mixed by the over-reef flow supplemented by wave motion. The bulk of the sewage discharge is dispersed outside of the reef and transported away from the harbor in the prevailing currents. However, with some combinations of wind and sea directions, a much larger fraction is swept back into the harbor. An estimated 46% of the harbor floor has been directly or indirectly disturbed by dredging. The harbor could be improved by holding pollution and disturbance to a low level locally. (Knapp-USGS)
W74-06292

THE OCCURRENCE OF RHIZOCHRYSIS LIMNETICA G. M. SMITH IN THE PLANKTON OF LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 2H.
W74-06337

INTERACTIVE EFFECTS OF SALINITY AND OZONE ON GROWTH AND YIELD OF GARDEN BEET,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 3C.
W74-06342

NUTRIENT ENRICHMENT AND CONTROL REQUIREMENTS IN THE UPPER CHESAPEAKE BAY, SUMMARY AND CONCLUSIONS,
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
L. J. Clark, D. K. Donnelly, and O. Villa, Jr.
August 1973. 24 p, append.

Descriptors: *Chesapeake Bay, *Eutrophication, *Nutrients, *Maryland, Water pollution control, Water pollution sources, Nitrates, *Nitrogen, Phosphates, *Phosphorus, Water pollution effects.
Identifiers: Baltimore(Md), *Susquehanna River Basin.

The upper portions of the Chesapeake Bay and its tidal tributaries are suffering from eutrophication problems. Water quality monitoring data collected between 1968 and 1971 show an upward trend in phosphorus levels and indicate that inorganic nitrogen may presently be the growth rate-limiting nutrient. In order to limit the maximum algal standing crop to 40 micrograms/liter chlorophyll a, total phosphorus and inorganic nitrogen concentrations should not exceed 0.12 mg/liter and 0.8 mg/liter, respectively. A dynamic estuary water quality model was used to ascertain the maximum allowable phosphorus and nitrogen loadings from the Susquehanna and from Baltimore to maintain these criteria for three different Susquehanna flow conditions (10,000, 30,000 and 50,000 cfs). For the two lower flow conditions a 70% reduction in the existing phosphorus load would be required from both the Susquehanna Basin and the Baltimore area. During the high flow condition a reduction of over 90% of the point source discharges in the Susquehanna must be realized to achieve the phosphorus criterion. Nitrogen is considerably less manageable in the Susquehanna basin than phosphorus, especially during higher flow periods. Nitrogen control may be a feasible alternative under extremely dry weather conditions, but concentrated slugs of nitrogen associated with storm water runoff would undoubtedly contravene the criterion because of the Bay's exceptionally long flushing time. (Knapp-USGS)
W74-06352

THE PCB STORY,
For primary bibliographic entry see Field 5A.
W74-06393

EFFECT OF DDT ON TEMPERATURE SELECTION OF SOME SALMONIDS,
University of the Panjab, Lahore (Pakistan). Dept. of Zoology.
M. Y. Javaid.
Pak J Sci Ind Res. Vol 15, No 3, p 171-176. 1972. Illus.
Identifiers: Atlantic salmon, Brook trout, Cyanide, *DDT, Potassium, Rainbow trout, *Salmon, *Salmonids, Temperature, *Thermal acclimation, *Trout.

Treatment for 24 hr with sublethal doses of DDT, ranging from 2-200 ppb, resulted in shifts in temperature selection of 3 species of salmonids. In both the Atlantic salmon and brook trout, in general, low doses of DDT decreased the selected temperature, higher doses increased it. In rainbow trout exposure to DDT led to only an upward shift in selected temperature. A shock-response to cold temperatures of the gradient was observed in both the Atlantic salmon and brook trout at higher DDT concentrations, while the rainbow-trout exhibited a shock-response to warm temperatures. Exposure of Atlantic salmon to potassium cyanide doses, ranging from 1-200 ppb, resulted in a downwards shift in selected temperature which was dose-dependent. The ATP-uncoupler 2,4-dinitrophenol treatment was without any effect on temperature selection of Atlantic salmon. Apparently DDT-induced changes in the behavior of fish observed were due to interference by DDT with the thermal acclimation mechanism. Metabolic rate as the causitive factor in thermal acclimation mechanism was discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-06394

SURVEY OF THE EFFECT OF ASHTON PAPER MILL EFFLUENT DISCHARGE ON THE WATER OF THE RIVER SEVERN,
Paper (London), Vol 179, No 4, p 179-180, Feb. 21, 1973. 2 fig, 1 tab.

Descriptors: *Pulp wastes, *Dissolved oxygen, Water pollution sources, *Waste water disposal, *Pollution abatement, Water pollution effects, *Estuaries, Rivers, Europe, Sulfite liquors, Discharge(Water), Waste water(Pollution), Industrial wastes, Pulp and paper industry, Mixing, Tides, Tidal waters, Effluents, Ultimate disposal, Waste disposal, Surveys, Waste dilution.
Identifiers: *Severn River(England), Ashton Paper Mill Ltd.(U.K.), England, Spent sulfite liquors, White water.

Studies were conducted to ascertain the effect of the effluent from an integrated pulp and paper mill (Ashton Paper Mill Ltd.) on the quality of the Severn River. The mill utilizes the tidal pattern of the river to control effluent discharge times. Paper machine white water is discharged continuously, but the spent sulfite (or neutral sulfite) pulping liquor is ponded during an incoming tide and discharged immediately after high tide. Aerial and surface surveys confirmed rapid mixing of the effluent with the estuary water, owing to the strong tidal action. Although the discharge has a relatively high BOD, no significant effect on the dissolved oxygen content of the river is discernible. (Witt-IPC)
W74-06414

CONTRIBUTIONS TO THE KNOWLEDGE ABOUT THE BIOLOGY AND ECOLOGY OF FRESHWATER OSTRACODS FROM THE NEIGHBORHOOD OF HAMBURG, (IN GERMAN),
Hamburg Univ. (West Germany). Museum of Zoology.
For primary bibliographic entry see Field 2H.
W74-06420

HEPATIC TUMORS IN THE GUPPY (LEBISTES RETICULATUS) INDUCED BY AFLATOXIN B1, DIMETHYLNITROSAMINE AND 2-ACETYLAMINOFLUORENE,
Tokyo Univ. (Japan). Dept. of Molecular Oncology.
S. Sato, T. Matsushima, N. Tanaka, T. Sugimura, and F. Takashima.
Identifiers: *Aflatoxin B-1, Carcinogens, *Fluorenes, Granulomatous, Guppy, Kidney, *Lebistes-Reticulatus, Lesions, Mesenteric, Nitrosamine, Sarcoma, *Toxins(Fish), *Tumors(Hepatic), Water pollution effects.

Guppies (Lebistes reticulatus) were fed 0.6 mg aflatoxin B1, 480 mg dimethylnitrosamine, or 30 mg 2-acetylaminofluorene/100 g powdered diet for several months. These carcinogens induced hepatic damage, hyperplastic nodules, and tumors of the liver, together with damage and tumorous lesions of other organs. Among fish receiving aflatoxin B1, 2 of 5 had hepatic tumors after 9 mo. and 6 of 11 after 11 mo. Hepatic tumors were found after 13 mo. in 2 of 20 fish given dimethylnitrosamine. The latter also had granulomatous kidney lesions and leiomyosarcoma in the mesentery. With 2-acetylaminofluorene, 1 of 3 fish developed hepatic tumors after 11 mo. and 3 of 13 fish after 13 mo. Carcinogenesis in a small fish such as the guppy provides a suitable model for simplifying carcinogenic experiments and the possibility of use of these fish to screen environmental carcinogens is discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-06438

EFFECTS OF ACID MINE DRAINAGE ON THE STREAM ECOSYSTEM OF THE EAST FORK OF THE OBEY RIVER, TENNESSEE,
North Carolina Wildlife Resources Commission, Elizabethtown.
L. E. Nicholas, Jr., and F. J. Bulow.
J Tenn Acad Sci. Vol 48, No 1, p 30-39, 1973. Illus.
Identifiers: *Acid mine drainage, *Chironomus, Ecosystem, *Euglena-Mutabilis, *Mine wastes, Rivers, *Sialis, Streams, *Tennessee(Obey River), Water pollution effects, Aquatic plants.

The stream ecosystem of the East Fork of the Obey River, Tennessee was studied from Jan. through Dec. 1970. Emphasis centered on water quality, macroinvertebrates, fish and aquatic flora affected by acid mine drainage. Two control stations were established within the study area, one above the pollution zone and the other below the zone of pollution. A reservoir station was established to detect any neutralization occurring within Dale Hollow Reservoir below the confluence of the East Fork and West Fork. An area approximately 40 miles in length was severely degraded by acid mine drainage. Limited macroinvertebrate populations existed within this region. Chironomus and Sialis were the predominate benthic indicator organisms present in the polluted zone. Euglena mutabilis was the most abundant representative organism of the aquatic flora. This organism was characteristic of acid mine pollution. Fish were recovered above and below, but not within, the zone of pollution. Fish recovered were characteristic of the type of habitat in which they were collected, being either typical stream or reservoir fish. A fish kill occurred in the East Fork embayment of Dale Hollow on Aug. 15, 1970 from acid mine drainage discharged upstream.--Copyright 1973, Biological Abstracts, Inc.
W74-06491

SEASONAL CHANGES IN ORGANIC NITROGEN CONTENT OF NET-AND NANNOPHYTOPLANKTON IN TWO HARDWATER LAKES,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
B. A. Manny.
Arc Hydrobiol. Vol 71, No 1, p 103-123. 1972.
Identifiers: Algal, Cell, Hard water, Lakes, *Nannoplankton, *Organic nitrogen, *Phytoplankton, Pigments, Plankton, Seasonal, *Productivity.

Seston at 1 m depth in 2 lakes representing extremes of hard water productivity was fractionated weekly for 14 mo. using 10 micro m Nitex netting. Net and anno fractions were analyzed by micro-Kjeldahl digestion for organic N, by aceton extraction for algal pigments and microscopically for algal cell volume. Comparison of organic N content of the 2 fractions with algal cell volume of cells larger and smaller than 10 micro m maximum dimension supported the hypothesis that nannophytoplankton contain more organic N and pigments/unit cell volume than netphytoplankton most of the year. Apparently, nannophytoplankton smaller than 10 micro m maximum dimension are responsible for more synthesis of cellular organic N than netphytoplankton in hard water lakes.--Copyright 1973, Biological Abstracts, Inc.
W74-06495

5D. Waste Treatment Processes

STUDIES IN THE ANALYSIS OF METROPOLITAN WATER RESOURCE SYSTEMS, VOLUME VIII: SOME DATA AND METHODS FOR ANALYZING METROPOLITAN WASTEWATER RECLAMATION AND REUSE SYSTEMS,
Cornell Univ., Ithaca, N.Y.
P. J-Y. Yang.
Available from the National Technical Information Service as PB-230 435, $7.50 in paper copy, $1.45 in microfiche. Cornell University Water Resources and Marine Sciences Center, Technical Report No. 78, 1974. 139 p, 31 fig, 26 tab, 71 ref. OWRR C-3101(3684)(4), 14-31-0001-3684.

Descriptors: *Water reclamation, *Water reuse, Water resources development, *Cost analysis, Water treatment, *Waste water treatment, Water users, *Systems analysis, *Water demand, Reclaimed water, Standards, Water quality, Mathematical models, Optimization, Water management, Effluents, Tertiary treatment, Water requirements, Water supply.

This study reviews some data and proposes some mathematical models that may be used to plan or design metropolitan wastewater reclamation and reuse systems. Specifically, optimization models have been developed for analyzing a wastewater reclamation project involving both water supply and water quality problems. The design problem examined involves the determination of least cost wastewater and water treatment plant capacities that satisfy water quantity and quality requirements at each water reuse site and also the quality constraints imposed on the waste receiving stream. In addition to developing a means of defining and evaluating alternative design for water reclamation and reuse systems that meet a variety of water quantity and quality requirements, the study also investigates the extent that water can be treated for reuse as an alternative in achieving water supply and pollution control objectives. The procedure of system optimization based on separable linear programming and the SUMT algorithms has been presented. The sensitivity of the least cost solution to varying demands for industrial water, varying transport distances, varying BOD influent concentrations to the wastewater treatment plant, and varying effluent standards for the receiving stream are discussed. (See also W74-01784) (Yang-Cornell)
W74-05951

RECYCLING MUNICIPAL SLUDGES AND EFFLUENTS ON LAND.
Proceedings of Joint Conference of Environmental Protection Agency, Department of Agriculture, and National Association of State Universities and Land-Grand Colleges, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land Grant Colleges, Washington, D.C. 1973. 244 p.

Descriptors: *Waste disposal, *Waste water disposal, Water law, *Sludge disposal, *Recycling, Legislation, Federal government, Regulation, State governments, Landfills, Public health, Research and development, Water pollution control, *Water reuse, *Waste water treatment.
Identifiers: Land disposal(Wastes).

Discharge of municipal wastewater has resulted in water pollution and air pollution. The impact of water and air quality standards, the tremendous quantities of sludges produced, and the expenditure of physical and monetary resources for conventional methods of wastewater treatment have prompted a search for alternative methods. One such alternative method, which utilizes land resources, is known as Soils Treatment Systems (STS). While not a new technology, its prior use has lacked the in-depth evaluations required to assure that STS's are environmentally acceptable. A conference entitled 'Recycling Municipal Effluents and Sludges on Land' discusses technical and institutional procedures to effectively use the resources available within the EPA, USDA, and Universities for a cooperative and coordinated research, development, and demonstration program. (See W74-05964 thru W74-05986) (Knapp-USGS)
W74-05963

FEDERAL AND STATE LEGISLATIVE HISTORY AND PROVISIONS FOR LAND TREATMENT OF MUNICIPAL WASTEWATER EFFLUENTS AND SLUDGES,
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 6E.
W74-05964

LAND APPLICATION OF WASTEWATER WITH A DEMOGRAPHIC EVALUATION,
Environmental Protection Agency, Washington, D.C.
B. L. Seabrook.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Illinois: National Association of Universities and Land-Grant Colleges, Washington, D.C. p 9-24, 1973. 3 fig.

Descriptors: *Waste water disposal, *Water spreading, *Recycling, Sludge disposal, Waste disposal, Waste treatment, Spray irrigation, Artificial recharge, Irrigation, Water purification, Water pollution control, *Water reuse.
Identifiers: *Land disposal(Wastes).

Land application of wastewaters from community and industrial processing sources is practiced successfully and extensively in the United States and in many countries throughout the world. Among the major reasons were: to provide for supplemental irrigation water; the desirability of augmenting groundwater sources; excessive distances of suitable bodies of receiving waters or extraordinary cost to construct facilities to reach suitable disposal sites; economic feasibility, as contrasted with the cost of construction and operation of advanced or tertiary treatment facilities; inability of conventional treatment facilities to handle difficult-to-treat wastes. Present land application facilities generally are not 'stressing' the system. Many facilities are using effluent on a crop-need basis. Uses include irrigation of parks, golf courses, cemeteries, college grounds, street trees, highway median strips, sports grounds, ornamental fountains and artificial lakes. Wastewater effluents are also used to irrigate many types of crops, including grasses, alfalfa, corn, sorghum, citrus trees, grapes, and cotton. Forest lands are also being irrigated in many areas. Groundwater augmentation to prevent salt water intrusion is being practiced. In Mexico, a wide variety of truck garden crops has long been irrigated with effluent. Crops appeared to benefit from both the nutrients and the increased amount of water which is applied. (See also W74-05963) (Knapp-USGS)
W74-05965

SOME EXPERIENCES IN LAND ACQUISITION FOR A LAND DISPOSAL SYSTEM FOR SEWAGE EFFLUENT,
Muskegon County Board, Mich. Dept. of Public Works.
J. C. Postlewait, and H. J. Knudsen.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D.C., p 25-38, 1973. 2 fig.

Descriptors: *Sewage disposal, *Waste water disposal, *Recycling, *Land tenure, Waste treatment, Sludge disposal, *Michigan.
Identifiers: *Land disposal(Wastes), *Muskegon County(Mich).

Some of the experiences in implementing the Muskegon County Wastewater Management System in the areas of land acquisition and relocation are described. The considerations which must be addressed in early planning in connection with putting together large tracts of land including legal phases and the political acceptance are discussed. The advantages which can be derived from the well planning multiple usage that such a site is capable of providing include possible power generation, the incentives for industrial expansion in the proximity, improved wildlife population, recreational potential, and agricultural advantages. (See also W74-05963) (Knapp-USGS)
W74-05966

THE PROPERTIES OF SLUDGES,
National Environmental Research Center, Cincinnati, Ohio.
R. B. Dean, and J. E. Smith, Jr.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D.C., p 39-47, 1973. 2 fig, 8 tab, 33 ref.

Descriptors: *Sludge disposal, *Water spreading, *Recycling, Fertilizers, Nutrients, *Waste disposal, Irrigation, Waste treatment, Sewage treatment, Heavy metals, Sewage disposal.
Identifiers: *Land disposal(Wastes).

Sludge is a liquid containing contaminants removed from wastewater by physical biological, and chemical treatments. Although sludge contains solids, the problem of of its disposal is not primarily a solid waste problem; it is rather the problem of disposing of the water that is in close association with waste solids. The major part of the cost of sludge treatment and disposal is directly related to the water. Dewatering and drying sludge are expensive operations. Sludge contains the major plant nutrients, nitrogen, phosphorus, and potassium, at levels that are about one-fifth of those found in chemical fertilizers. The sludge that is sold for agriculture and horticulture is bought for its content of organic slow-release nitrogen and other organic matter that improves the physical properties of the soil. Heavy metals occurring in quantities that are significant to agriculture include zinc, copper, nickel, cadmium, mercury, and lead. Zinc and copper are essential micronutrients that are present in sludges at concentrations in excess of those present in soils. The long history of successful use of sludge as a soil amendment in agriculture indicates that the hazards are slight and probably are easily controlled by appropriate farm practices. (See also W74-05963) (Knapp-USGS)
W74-05967

CHARACTERISTICS OF MUNICIPAL EFFLUENTS,
Metcalf and Eddy, Inc., Palo Alto, Calif.

C. E. Pound, and R. W. Crites.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D.C., p 49-61, 1973. 12 tab, 19 ref.

Descriptors: *Waste water disposal, *Irrigation, *Recycling, Water spreading, Sprinkler irrigation, Water quality, Sewage treatment, Waste treatment, Waste water treatment, Water pollution control, *Water reuse.
Identifiers: *Land disposal(Wastes), Spray irrigation.

Physical, chemical, and biological characteristics of municipal wastewaters are discussed with respect to land application. Constituents of raw wastewater and effluents from four types of plants are included. These constituents are compared to those of acceptable irrigation waters and to the relative amounts of each that would normally be applied to the land. The most important physical characteristic of wastewater is its total solids content. The solids include floating, suspended, colloidal, and dissolved matter. The solids are important because they have a tendency to clog the soil pores and coat the land surface. The chemical properties of wastewater can be divided into three categories: organic matter, inorganic matter, and gases. The organic matter in wastewater is in the dissolved form as well as settleable solid form, and it is principally composed of proteins (40 to 60 percent), carbohydrates (25 to 50 percent), and fats and oils (10 percent). Other organic compounds, such as phenols, surfactants, and agricultural pesticides, are generally present in small quantities. Many of the inorganic compounds provide nutrients for the vegetation, but they also can be toxic to plants at certain concentrations. Wastewater may contain pathogenic organisms which cause diseases, such as salmonella gastroenteritis, typhoid and paratyphoid fevers, bacillary and ameobic dysentery, cholera, and infectious hepatitis. Pretreatment is required to remove the bulk of these microorganisms from the wastewater. Adequate disinfection requires complete and rapid mixing and minimum contact time. The presence of suspended solids hinders the process of disinfection; therefore, secondary effluent is more readily disinfected than primary effluent. (See also W74-05963) (Knapp-USGS)
W74-05968

A REGIONAL VIEW ON THE USE OF LAND FOR DISPOSAL OF MUNICIPAL SEWAGE AND SLUDGE,
Environmental Protection Agency, Chicago, Ill. Region V.
R. J. Schneider.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D.C., p 63-66, 1973.

Descriptors: *Water Quality Act, *Federal Water Pollution Control Act, *Recycling, Conferences, *Sludge disposal, *Waste water disposal, Waste disposal, Water law, Water pollution control, Water reuse.
Identifiers: *Land disposal(Wastes).

Federal, State and local cooperative actions necessary to bring a municipal waste treatment project to completion are briefly discussed. New national water pollution control legislation challenges conventional methods and conventional thinking. It sets new requirements and goals. This workshop discussion is concerned with the particular challenge in the law with regard to finding land based alternatives for the handling of municipal wastewater. (See also W74-05963) (Knapp-USGS)
W74-05969

THE PHYSICAL PROCESSES IN THE SOIL AS RELATED TO SEWAGE SLUDGE APPLICATION,
Agricultural Research Service, Beltsville, Md.
E. Epstein.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D.C., p 67-73, 1973. 11 fig, 10 ref.

Descriptors: *Sludge disposal, *Soil disposal fields, *Recycling, *Soil physical properties, *Biodegradation, Soil chemistry, Hydraulic conductivity, Soil structure, Soil-water-plant relationships, Soil gases, Water reuse.
Identifiers: *Land disposal(Wastes).

Adding sewage sludge initially increases the hydraulic conductivity of a soil, but the conductivity later decreases. This decrease appears to be due to clogging of soil pores by microbial decomposition products. Soil structure affects soil water, soil air, mechanical impedence and root distribution. Organic matter, through the activity of microorganisms, increases soil aggregation. Sewage sludge application increased the stable aggregate 16% to 33%. The low oxygen and high carbon dioxide contents in the soil that result from high sludge application can reduce root growth, nutrient uptake and plant growth. Other gas products of decomposition, such as methane and etheylene, can be detrimental to plants. (See also W74-05963) (Knapp-USGS)
W74-05970

PHYSICAL CHANGES TO SOILS USED FOR LAND APPLICATION OF MUNICIPAL WASTE--WHAT DO WE KNOW, WHAT DO WE NEED TO KNOW,
Michigan State Univ., East Lansing.
A. E. Erickson.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 75-77, 1973.

Descriptors: *Sludge disposal fields, *Recycling, *Soil physical properties, *Biodegradation, Soil chemistry, Hydraulic conductivity, Soil structure, Soil-water-plant relationships, Soil gases, Water reuse.
Identifiers: *Land disposal(Wastes).

The physical changes in soils due to the application of municipal waste vary greatly depending on the kind of soil, type of waste, and quantity of waste applied. In coarse-textured, single-grained soils the sludge will condition the soil by its function as a surface active and water absorbing additive. The soil water properties are improved the water held at any tension is increased, and the soil nutrient sorption capabilities are increased. In fine-textured soils which are low in organic matter, sludge can supply the organic matter for the formation of a stable structure which could increase the infiltration and permeability, decrease the bulk density, increase the porosity, and improve the productive capacity. The amount of sludge used in most cases is more apt to be limited by the potential of the amended soil to leak nutrients than for them to be overloaded physically. In very bad situations where the physical problems are critical (such as mine spoil) large quantities of sludge produce the immediate physical soil improvement which is required for reclamation. Because sewage has more organic matter than effluent and is more biologically active, it is better soil amendment than effluent alone. The development of processes to remove the public health hazard of raw sewage would greatly improve systems which remove the BOD and concentrate other materials often to toxic concentrations, in the sludge. (See also W74-05963) (Knapp-USGS)
W74-05971

SOIL MICROBIOLOGICAL ASPECTS OF RECYCLING SEWAGE SLUDGES AND WASTE EFFLUENTS ON LAND,
Ohio State Univ., Columbus.
R. H. Miller.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 79-90, 1973. 7 fig, 50 ref.

Descriptors: *Sludge disposal, *Waste water disposal, *Recycling, *Soil microbiology, Path of pollutants, *Biodegradation, Nutrients, Trace elements, Heavy metals, Soil environment, Water pollution effects, Water reuse.
Identifiers: *Land disposal(Wastes).

The biological component of soil which includes bacteria, actinomycetes, fungi, algae and soil micro- and macroanimals makes significant contributions to waste recycling by decomposing organic compounds, eliminating some toxins, eliminating pathogenic microorganisms, and by influencing the solubility and mobility of inorganic ions. Present knowledge of these microbial reactions is reviewed and used to emphasize significant areas of needed research. Recycling sewage sludges on land will present different management problems from those associated with effluent recycling. Applications of anaerobically digested sewage at the rates presently being recommended for soils will result in a net accumulation of soil organic matter. Organic matter in soils is normally considered a valuable resource because of its influence on soil structure, water holding capacity, water permeability, cation exchange capacity, and adsorption of heavy metals. However, frequent large applications of sewage sludge or single massive applications could result in an accumulation of organic matter which would adversely affect ion solubility and availability, plant growth, or environmental quality. Application rates for both effluent and sewage should be based on the amount of mineralized nitrogen removed by the accompanying crop. Chemical fixation of orthophosphate by Fe, Al, Ca, and clay minerals in soil and removal by growing plants provide the primary mechanisms for restricting the mobility of phosphorus applied with effluents and sludges. (See also W74-05963) (Knapp-USGS)
W74-05972

INORGANIC REACTIONS OF SEWAGE WASTES WITH SOILS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
W. L. Lindsay.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 91-96, 1973. 1 fig, 13 ref.

Descriptors: *Sludge disposal, *Waste water disposal, *Soil disposal fields, *Heavy metals, *Trace elements, Path of pollutants, Ion exchange, Solubility, Recycling, Nutrients, Food chains, Landfills, Soil chemistry, Soil chemical properties, Water reuse.
Identifiers: *Land disposal(Wastes).

Sewage wastes decompose in soils to C02, water, residual soil organic matter, and inorganic constituents. The more soluble elements, which are generally Na, K, Ca, Mg, Cl, S04, N03, and H3B03, either remain in solution or exchange with ions on exchange sites on soil surfaces. Another group of elements, which include Zn, Cd, Pb, Cu, Ni, Cr, Hg, Mn, Co, P, As, Se, and Mo, from compounds and reaction products of intermediate solubility. Under many soil conditions these elements are sufficiently soluble that they are taken up by plants and cycled into the food chain of animals and man. Basic studies are needed to predict the long-term fate of potentially toxic heavy metals and other inorganic constituents that are

added to soils by the addition of sewage wastes. (See also W74-05963) (Knapp-USGS)
W74-05973

ORGANICS,
California Univ., Davis.
F. E. Broadbent.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 97-101, 1973. 1 fig, 3 tab, 5 ref.

Descriptors: *Sludge disposal, *Soil disposal fields, *Recycling, *Organic matter, Biodegradation, Nutrients, Soil structure, Humus, Decomposing organic matter, Water reuse.
Identifiers: *Soil organic matter, *Land disposal(Wastes).

The organic components of sewage sludge are partly undecomposed substances and partly microbial cells and by-products synthesized during the treatment process. Most substances in both categories are readily biodegradable and undergo extensive decomposition when incorporated in soils. Part of the sludge applied to soil becomes part of the soil humus after extensive modification, but most is converted to simple inorganic compounds. Sludge may contribute to soil improvement through its favorable effect on such soil properties as moisture holding capacity, structural stability, and cation retention. (See also W74-05963) (Knapp-USGS)
W74-05974

LAND TREATMENT OF LIQUID WASTE: THE HYDROLOGIC SYSTEM,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
H. Bouwer.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 103-111, 1973. 5 fig, 12 ref.

Descriptors: *Waste water disposal, *Water spreading, Soil disposal fields, *Path of pollutants, Water pollution control, Groundwater movement, Hydrology, Recharge, Soil water movement, *Recycling, *Water reuse, Waste water treatment.
Identifiers: *Land disposal(Wastes).

The main hydrologic factors to be considered in the design and operation of land treatment systems are (1) infiltration rates, (2) response of groundwater to infiltration, (3) effect of system design and management on quality of renovated water, and (4) control of underground spread of renovated water below the water table. Principles of controlling the spread of renovated water are presented for deep and shallow aquifers. Because the performance of a land treatment system for liquid waste depends so much on the local conditions of soil, climate, and hydrogeology, pilot systems should precede any large-scale development. (See also W74-05963) (Knapp-USGS)
W74-05975

LAND RESOURCES,
Soil Conservation Service, Washington, D.C.
K. W. Flach.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 113-119, 1973. 2 fig, 2 tab.

Descriptors: *Waste disposal, *Sludge disposal, *Recycling, *Water spreading, Hydrogeology, Land use, Soil properties, Waste water disposal, Irrigation, *Water reuse.
Identifiers: *Land disposal(Wastes).

Soil, climatic, geologic, and institutional factors have to be considered in selecting sites for waste disposal on land. Runoff, erosion, permeability, infiltration capacity, and available water holding capacity are important soil properties. The balance and distribution of precipitation and evapotranspiration are important climatic considerations, and lithology, jointing, and groundwater relationships are important geologic factors. Availability of public land and farm size must also be taken into account. Soil surveys conducted by the Soil Conservation Service of the United States Department of Argiculture and its cooperators can be used for evaluating the feasibility of disposal systems and for locating sites. Soils suitable for waste disposal are available near most metropolitan areas, but the ecological, economic, and institutional factors are most favorable in the arid western United States. (See also W74-05963) (Knapp-USGS)
W74-05976

SOIL-PLANT RELATIONSHIPS (SOME PRACTICAL CONSIDERATIONS IN WASTE MANAGEMENT),
Illinois Univ., Urbana.
S. W. Melsted.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 121-128, 1973. 1 tab, 27 ref.

Descriptors: *Sludge disposal, *Waste water disposal, *Recycling, *Soil-water-plant relationships, *Water reuse, Water pollution effects, Path of pollutants, Nutrients, Biodegradation, Heavy metals, Trace elements.
Identifiers: *Land disposal(Wastes), Spray irrigation.

Soil-plant relationships that may influence municipal sludge and effluent applications on land include nutrient mobility in the soil, ion absorption by plants, methods of determining plant composition through soil analysis, importance of sludge placement to ion absorption by crops, and nutrient absorption through foliar feeding. Monitoring problems, especially as related to soil or plant analysis, are discussed with plant analysis rated more practical at this time. Normal plant composition ranges and suggested tolerance levels for toxic heavy metals are given. Research recommendations meriting high priorities include (1) defining the available form of heavy metals, (2) correlation studies between soil levels and plant composition, (3) absorption of noxious compounds from foliar spray irrigation, (4) determination of residual nutrient levels in 'living filter systems' of effluent treatment, (5) determination of tolerance levles of toxic heavy metals permissible in feeds and foods and (6) determining disposal management systems that maximize the beneficial properties while minimizing the hazards from applying municipal sludges and effluents on land. (See also W74-05963) (Knapp-USGS)
W74-05977

CROP AND FOOD CHAIN EFFECTS OF TOXIC ELEMENTS IN SLUDGES AND EFFLUENTS,
Agricultural Research Service, Beltsville, Md.
R. L. Chaney.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 129-141, 1973. 15 tab, 45 ref.

Descriptors: Heavy metals, *Sludge disposal, *Water spreading, *Recycling, *Soil disposal fields, Cadmium, Cabolt, Chromium, Copper, Mercury, Nickel, Lead, Zinc, Toxicity, Path of pollutants, Water pollution effects, *Water reuse.
Identifiers: *Land disposal(Waters).

Sewage sludge and effluent are applied to soil with the intent that toxic elements be retained by the soil. These elements will accumulate and persist, and are the long-term environmental hazard in land application. Elements in sludge and effluent that are potential hazards to plants or food chains are: B, Cd, Co, Cr, Cu, Hg, Ni, Pb, and Zn. Accumulations of Cd, Cu, Zn, and Ni are related to the high phosphate and organic matter contents of sludge and effluent. There are numerous examples of metal toxicity in agriculture. Toxic amounts of Cu, Zn, or Ni have accumulated in soils from fungicides, unneeded fertilizers, and sewage sludge, or have occurred naturally. Most toxicities have occurred under intensive agricultural practices, such as orchards, vineyards, or vegetable fields, and can be quite expensive to alleviate. Toxicities to crops generally have occurred in unmanaged situations most favorable for toxicity: low pH, sandy soils, high metal sludges, and/or metal-sensitive crops. These toxicities have often been alleviated by liming to higher soil pH. (See also W74-05963) (Knapp-USGS)
W74-05978

CROP SELECTION AND MANAGEMENT ALTERNATIVES--PERENNIALS,
Pennsylvania State Univ., University Park.
W. E. Sopper.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 143-153, 1973. 10 tab, 10 ref.

Descriptors: *Irrigation water, *Waste water disposal, *Recycling, *Sprinkler irrigation, Grasses, Forests, Trees, Nutrients, Sewage disposal, Sludge disposal, Vegetation effects, *Water reuse.
Identifiers: *Land disposal(Wastes).

Perennial vegetation can be utilized as part of the land management system of a municipal wastewater disposal site. The use of perennials in the land management system of the disposal site may depend upon whether spray irrigation will be continued throughout the year or only operated during the warm summer growing season. If annual spray irrigation is contemplated, forests or perennial grasses may have to be used, particularly in the northern climates where temperatures drop and remain below freezing for prolonged periods of time. These vegetation types will normally provide better winter infiltration conditions because of the accumulation or organic matter which provides an insulation layer on the soil surface and reduces soil freezing. In addition, the acid conditions generally associated with forest soils provide a larger phosphorus adsorptive capacity. Perennial grasses appear to be suitable for wastewater disposal sites and have received the most attention. In general, they have fibrous root systems, are sod forming, which aids in erosion control and provides for high infiltration rates, are tolerant of a wide range of ecological conditions, have a long period of growth and have a high uptake of nutrients. (See also W74-05963) (Knapp-USGS)
W74-05979

RECYCLING URBAN EFFLUENTS ON LAND USING ANNUAL CROPS,
Arizona Univ., Tucson. Dept. of Agronomy and Plant Genetics.
A. D. Day.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 155-160, 1973. 19 ref.

Descriptors: *Irrigation water, *Waste water disposal, *Recycling, *Sewage disposal, Nutrients, Fertilizers, Crops, Crops response, *Water reuse, Soil-water-plant relationships.
Identifiers: *Land disposal(Wastes).

Because municipal wastewater contains more fertilizer elements (nitrogen, phosphorus, and potassium) than do most other forms of irrigation water, it offers an agricultural potential that should be exploited. High yields of food, feed, forage, oil, and fiber plant products may be obtained from crop plants utilizing municipal wastewater as a source of irrigation water and plant nutrients. Soil irrigated with wastewater had a lower infiltration rate, higher modulus of rupture, and more soluble salts, nitrates, and phosphates than did soil irrigated with well water and fertilized with suggested amounts of nitrogen, phosphorus, and potassium. Irrigation with wastewater (sewage effluent) for 14 years did not decrease field crop yields or result in any adverse effects on soil that could not be corrected with minor changes in field crop culture. (See also W74-05963) (Knapp-USGS)
W74-05980

ENGINEERING AND ECONOMICS OF SLUDGE HANDLING,
Bauer Engineering, Inc., Chicago, Ill.
W. J. Bauer.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 161-167, 1973. 1 fig, 2 tab.

Descriptors: *Sludge disposal, *Fertilizers, *Costs, *Recycling, Sludge treatment, Transportation, *Water reuse.
Identifiers: *Land disposal(Wastes).

For beneficial use of municipal sludges, there are a great number of possible combinations of sludge transportation and application schemes which can be developed. The range of costs from $37 to $52 per dry ton is relatively small. These costs are competitive with incineration. The transportation and land application systems are usually low in capital cost, and relatively more expensive in operating cost than would be the incinerators as long as the incinerators would not require repair. A cost of $50 per dry ton of sludge for disposal corresponds to less than two dollars per capita per year, as the sludge from roughly 30 persons amounts to about one dry ton per year. Possible differences in cost arising from alternative systems are even smaller. Considerations other than cost should determine the best use of this resource rich in organic material. (See also W74-05963) (Knapp-USGS)
W74-05981

RECYCLING MUNICIPAL SLUDGES AND EFFLUENTS ON LAND,
Williams and Works, Grand Rapids, Mich.
T. C. Williams.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973 , Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 169-173, 1973.

Descriptors: *Waste water disposal, *Sewage disposal, *Recycling, *Water spreading, *Irrigation water, Sprinkler irrigation, Soil disposal fields, Water reuse, Waste water treatment.
Identifiers: *Land disposal(Wastes).

The degree of pretreatment required for disposal of sewage on land varies depending upon the type of land treatment. For spray irrigation, treatment should be equivalent to the treatment for disposal of the liquid into surface water. For flood irrigation, perhaps treatment of a lesser degree is satisfactory. For grass filtration perhaps simple primary treatment is adequate. But on all of these, the question of public acceptance must be considered. To get public acceptance, the material put on to the land for further treatment should be at least as good as what goes into rivers except for the removal of nutrients. In the northern part of the United States, irrigation is impossible in the winter time. All of the wastewater that is generated during the winter season must be stored. Land availability and isolation are also related to the treatment. (See also W74-05963) (Knapp-USGS)
W74-05982

ECONOMIC ASPECTS OF THE APPLICATION OF MUNICIPAL WASTES TO AGRICULTURAL LAND,
Illinois Univ., Urbana.
W. D. Seitz, and E. R. Swanson.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 175-182, 1973. 5 fig, 1 tab, 22 ref.

Descriptors: *Waste water disposal, *Sludge disposal, *Recycling, Economics, *Cost-benefit analysis, Costs, Irrigation, Crops, Crop response, Crop production, *Water reuse.
Identifiers: *Land disposal(Wastes).

Minimizing the cost of waste treatment and of its disposal on agricultural land was analyzed. In the process of cost-minimization, account is taken of crop returns from application of waste and of environmental damage. The optimal rate of application of waste to crops is influenced by all variables and functions in the system, including the marginal cost of alternative methods of treatment and disposal. A simulation analysis of a particular land-reclamation sludge-disposal project is described. The variables most influential in performance of the system included transport costs for sludge, site preparation costs, assumptions regarding the nitrogen budget, choice of cropping system, and source of labor used in site preparation. (See also W74-05963) (Knapp-USGS)
W74-05983

MONITORING CONSIDERATIONS FOR MUNICIPAL WASTEWATER EFFLUENT AND SLUDGE APPLICATION TO THE LAND,
Michigan Dept. of Natural Resources, Lansing.
P. A. Blakeslee.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 183-198, 1973. 2 tab.

Descriptors: *Recycling, *Waste water disposal, *Sludge disposal, Water pollution, *Monitoring, Path of pollutants, Design, Planning, *Water reuse.
Identifiers: *Land disposal(Wastes).

Monitoring the performance of the many interrelated systems which are involved in applying wastewater or wastewater sludge to the land cannot be looked upon as a substitute for a full understanding of system response prior to project commitment. The role of an ongoing monitoring program should be to confirm judgments made at the design stage and where inadequate information is currently available to assure with reasonable certainty the nature of system response adequate safeguards must be provided. An overview is given of current effluent and wastewater sludge quality at Michigan municipal wastewater treatment plants. Guidelines being used in Michigan for groundwater monitoring associated with on-land disposal systems are presented. (See also W74-05963) (Knapp-USGS)
W74-05984

INSTITUTIONAL OPTIONS FOR RECYCLING URBAN SLUDGES AND EFFLUENTS ON LAND,
Metropolitan Sanitary District of Greater Chicago, Ill.
R. R. Barbolini.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Illinois: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 199-205, 1973.

Descriptors: *Recycling, *Sludge disposal, Fertilizers, *Planning, *Instututions, Governments, Land use, Economics, Institutional constraints, *Water reuse.
Identifiers: *Land disposal(Wastes).

Institutional options for recycling effluents and sludges from urban wastewater treatment plants on land include numerous alternative methods for financing, operating, and organizing large-scale programs. The effects of technical, social, political and legal constraints are significant in the determination of preferredalternatives. The experiences of the Metropolitan Sanitary District of Greater Chicago (MSDGC) are used to illustrate available institutional options. The MSDGC has been active in land application of sludge and is currently engaged in a very large-scale project to apply sludge to rural, stripmined land approximately 200 miles from the center of its collection and treatment activities. Preferred methods of financing are bond sales or State and Federal grants for capital improvements, and current taxation for normal maintenance and operation activities. The preferred alternate for operation of land application facilities the purchase of large rural tracts. Land development must be achieved through careful planning activities conducted with close cooperation between local government agencies of the rural receiving area and the urban producing area. There is an urgent need for State and Federal conceptual commitment, and financial and technical assistance to land application programs. (See also W74-05963) (Knapp-USGS)
W74-05985

PUBLIC ACCEPTANCE--EDUCATIONAL AND INFORMATIONAL NEEDS,
Purdue Univ., West Lafayette, Ind.
J. O. Dunbar.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Ill: National Association of State Universities and Land-Grant Colleges, Washington, D C, p 207-211, 1973. 3 ref.

Descriptors: *Recycling, *Sludge disposal, Fertilizers, *Planning, *Insutitutions, Public rights, Governments, Land use, Economics, Institutional constraints, Public health, Water reuse.
Identifiers: *Land disposal(Wastes), *Public acceptance.

For an idea such as recycling urban sewage and sludge to the land to be implemented in our society, it must have public acceptance. It must be acceptable to the majority of the people. It must be actively supported by a large enough number of individual leaders so that they can favorably inform the people who depend upon them and keep those who oppose it in the minority. It must have enough support by both private and public groups so that they will use their organizational, financial, and political strength to bring about its implementation. An educational and informational program helps win public acceptance. In order to use limited resources efficiently, such programs should be carefully thought through and analyzed. Necessary information should be developed and disseminated as quickly as possible. (See also W74-05963) (Knapp-USGS)
W74-05986

INACTIVATION OF POLIOVIRUS IN WATER BY OZONATION,
Maine Univ., Orono. Dept. of Civil Engineering.
S. B. Majumdar, W. H. Ceckler, and O. J. Sproul.
Journal Water Pollution Control Federation, Vol 45, No 12, p 2433-2443, December 1973. 9 fig, 2 tab, 10 ref.

Descriptors: Ozone, Waste water(Pollution), Mathematical studies, *Waste water treatment, *Viruses, Cultures, Water pollution, Continuous flow.
Identifiers: *Inactivation, Survival, *Polioviruses, *Ozonation, Batch cultures, Continuous cultures, Distilled water.

The objective of the present study was to delineate the basic mechanism of inactivation of poliovirus (Type 1) by ozonation. Specific investigations, including both batch and continuous flow experiments, were carried out to determine the rate equations of poliovirus inactivation with respect to contact time and ozone concentration in triple distilled water and primary and secondary wastewaters. The poliovirus was grown and harvested in LLC-MK2 (Hull) continuous monkey kidney cells. The concentration and purification procedure gave a suspension with a titer of about 10 to the 7th power to 10 to the 7.5 power plaque forming units (PFU)/ml with a chemical oxygen demand (COD) of about 8 mg/ml. Virus survival data in triple distilled water with ozone concentrations from 0.13 to 1.18 mg/l indicate that there was a sudden decrease in virus survival at about 1 mg/l of initial ozone concentration. The data for the primary and secondary wastewater continuous flow studies show that approximately the same amount of inactivation was obtained in primary and secondary wastewater under similar conditions of ozone residual and contact time. The data indicate that, in addition to ozone concentration, contact time is an important consideration for virus inactivation. A contact time of 4 min gave a higher inactivation compared with 2 min for the same initial ozone concentration. Generally speaking, the rate of disinfection is a function of four variables: (1) the contact time, (2) the concentration of the disinfectant, (c) the number of organisms, and (3) the temperature of the water. (Mortland-Battelle)
W74-06156

LUXURY UPTAKE OF PHOSPHATE BY ACTIVATED SLUDGE,
Notre Dame Univ., Ind. Dept. of Civil Engineering.
J. B. Carberry, and M. W. Tenney.
Journal Water Pollution Control Federation, Vol 45, No 12, p 2444-2462, December 1973. 24 fig, 3 tab, 29 ref.

Descriptors: *Waste water treatment, *Phosphates, *Absorption, *Activated sludge, Path of pollutants Biomass, Nutrient removal, Radioactivity techniques, Carbon, Phosphorus, Water quality, Statistical methods, Calcium, Ions, Solubility, Tracers, Cations, Cytological studies, Aeration, Chemical oxygen demand, Suspended solids, Hydrogen ion concentration.
Identifiers: 2 4-Dinitrophenol.

A series of experiments were performed to determine the mechanism of luxury uptake of phosphate by activated sludge. Solubility calculations and calcium ion analyses indicated that removal does not occur by chemical precipitation. Poisoning experiments using 2, 4-dinitrophenol, biomass extraction experiments, and experiments using radioactive tracers with cation supplements indicated that the phosphate removal occurred by a biological mechanism causing the phosphate to be transported across the cell membrane. The mechanism seemed to involve active transport because the biomass was able to concentrate phosphate in the cell. Certain monovalent cations seemed to control the transport. Carbon and phosphorus seemed to be transported independently. (Mortland-Battelle)
W74-06157

OZONE DISINFECTION OF INDUSTRIAL-MUNICIPAL SECONDARY EFFLUENTS,
Welsbach Ozone Systems Corp., Philadelphia, Pa.
C. Nebel, R. D. Gottschling, R. L. Hutchison, T. J. McBride, and D. M. Taylor.
Journal Water Pollution Control Federation, Vol 45, No 12, p 2493-2507, December 1973. 13 fig, 6 tab, 18 ref.

Descriptors: *Ozone, *Industrial wastes, *Municipal wastes, Effects, *Effluents, *Sewage bacteria, *Disinfection, *Waste water treatment, *Viruses, Water quality, Oxidation, Coloforms, Turbidity, Color, Dissolved oxygen, Flotation, Hydrogen ion concentration, Suspended solids, Nitrates, Phosphates, Chemical oxygen demand, Biochemical oxygen demand, Carbon, Fish, Froth flotation.
Identifiers: Ozonation, Fecal coliforms, Pollutant removal, Fecal streptococci.

A pilot study of ozonation of industrial-municipal secondary effluent has demonstrated that ozone can be used successfully as an alternative to chlorination for rapid disinfection and concurrent tertiary treatment. Ozone at a dosage of 15 mg/l was contacted with the effluent in a chamber baffled to provide an over-and-under flow path. Fecal coliforms were reduced to 103/100 ml, and total coliforms and fecal streptococci to 500 and 9/100 ml, respectively. The viruses not destroyed by secondary treatment were rapidly eliminated by ozonation. The process improved other effluent quality parameters (oxygen demand, turbidity, and color) by direct oxidation, and flotation. The ozonated effluent is nontoxic and high in dissolved oxygen, and resembles potable water in appearance. (Mortland-Battelle)
W74-06159

COMPETITIVE GROWTH OF SALMONELLA AND PSEUDOMONADS IN TETRATHIONATE ENRICHMENT BROTH,
Aarhus Univ. (Denmark). Inst. of Hygiene.
For primary bibliographic entry see Field 5C.
W74-06168

THE LONG LITTERED PATH TO CLEAN AIR AND WATER,
G. Bylinsky.
Fortune Magazine, Vol 82, p 112-115, 133-134, October, 1970.

Descriptors: *Federal government, *Waste treatment, *Pollution control, *Long-term planning, *Treatment facilities, Water pollution control, Water pollution effects, Water pollution sources, Water pollution treatment, Water purification, Water policy, Water management, Water conservation, Waste water treatment, Environmental sanitation, Industrial wastes, Municipal wastes, Waste water disposal, Water quality, Treatment, Sewage treatment, Chemical wastes, Water reuse, Watersheds, Marine life.

Cleaning up the country's air and water will be a much tougher, slower and costlier job than politicians and environmentalists sometimes contend. Enforcement of strict new legislation will speed up the process, but legislation and public pressures alone are not enough. Without advances in technology, the big clean-up can only plod along. There are serious lags in new pollution-control technology, as well as in the readiness of business, government and the public to encourage, apply and pay for technological improvements. In water pollution control, the great problem is excessive adherence to old methods rather than a lack of new ones. Two billion dollars of federal monies per year go into old-fashioned sewage treatment plants, which can not cope with today's complex chemical pollutants. Critics say the government should expand its meager regional-studies and research programs. They also recommend the construction of big sewage-treatment plants capable of handling waste from a large area. Pipelines for waste discharge could bypass the estuaries and spawning areas for much marine, life, and discharge the treated effluent far out at sea. Eventually, the answer is indefinite recycling and re-use of water. (Silber-Florida)
W74-06234

NITRIFICATION AND DENITRIFICATION FACILITIES,
Metcalf and Eddy, Inc., Boston, Mass.
H. E. Wild, Jr., C. N. Sawyer, and T. C. McMahon.
Available from NTIS, Springfield, Va 22151, PB-215 693, Price $3.00 printed copy, $1.45 microfiche. Contract Report prepared for Environmental Protection Agency, July 1971. 55 p, 22 fig, 1 tab, 11 ref.

Descriptors: *Nitrification, *Sewage treatment, Waste treatment, Sewage bacteria, Tertiary treatment, Denitrification, *Treatment facilities, *Waste water treatment.

A 10-gpm pilot nitrification unit, receiving settled high-rate trickling filter effluent, was operated open to the weather from October 1969 through April 1970. Studies on the influence of temperature and pH were made in the laboratory using return sludge from the nitrification unit and settled trickling filter effluent. The ammonia nitrogen concentration did not inhibit nitrification in concentration of less than 60 mg/liter. pH affected the rate of nitrification. Optimum pH was 8.4. Temperature affected the rate of nitrification. The rate increased through the range of 5 deg C to 30 deg C. The time required for nitrification is directly proportional to the amount of nitrifiers present in the system. Instantaneous increases or decreases in BOD concentration from 50 mg/liter to 5 or to 110 mg/liter did not affect the rate of nitrification. (Knapp-USGS)
W74-06274

PHYSICAL-CHEMICAL NITROGEN REMOVAL FROM MUNICIPAL WASTEWATER,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
A. F. Cassel, T. A. Pressley, W. W. Schuk, and D. F. Bishop.
Available from NTIS, Springfield, Va. 22151 as PB-214 563; Price $3.00 printed copy; $1.45 microfiche. March 1971. 27 p, 6 fig, 7 tab, 15 ref.

Descriptors: *Ion exchange, *Ammonia, *Waste water treatment, *Chlorination, Tertiary treatment, Nitrates, *Nitrogen, Zeolites.
Identifiers: Clinoptilolite.

Selective ion exchange for ammonia removal, using the natural zeolite, clinoptilolite, was applied to lime clarified and filtered raw wastewater both before and after carbon adsorption. Intermittent operation of the ion exchange unit with minimum operator surveillance produced an average of 75% removal of NH3-N over a 10-month period. With 24-hour surveillance of the operation, and an inlet NH3-N of 12 mg/per liter, the residual NH3-N averaged 0.6 mg/liter for a 95% removal. Breakpoint chlorination for ammonia removal was applied in the pilot plant to filtered secondary effluent and to selective ion exchange effluent. Chlorination of filtered secondary effluent in an agitated reactor removed essentially all the NH3-N with 95% conversion to N2 gas. The CL:NH3-N weight ratio required for successful breakpoint was 8 to 9:1. Base usage, a function of chlorine dosage and the reaction pH, ranged from 0.88 pounds NaOH per pound of CL2 at pH 6.0 to 1.67 pounds per pound at pH 7.9. Nitrate formation, a function of pH, ranged from 3.6% of influent NH3-N at pH 6.0 to 5.9% at pH 8.0. Operation at pH greater than 6.0 with good mixing and chlorine dosage control produced essentially no nitrogen trichloride. (Knapp-USGS)
W74-06355

STUDY OF HYDROPHILIC MEMBRANES FOR OIL-WATER SEPARATION,
Gulf Environmental Systems Co., San Diego, Calif.
C. E. Milstead, and J. F. Loos.

Available from NTIS, Springfield, Va. 22151 as AD-758 321; Price $3.00 printed copy; $1.45 microfiche. Final Report to Department of Transportation, January 1973. 81 p, 23 fig, 7 tab, 10 ref. DOT-CG-24291

Descriptors: Oil spills, *Water pollution treatment, *Membrane processes, *Separation techniques, Membranes, *Oil pollution, Oily water, *Waste water treatment, Water pollution control.

Hydrophilic membranes were tested for oil-water separations and to evaluate their applicability for shipboard use. Twenty membranes were screened with respect to oil rejection capabilities and product water flux. The most promising membrane, a surface-hydrolyzed cellulose acetate, showed essentially complete oil rejection. The effects of input feed temperature, flow rate, salt concentrations, applied pressure, and type and concentration of oil contaminants were determined. Several simple cleaning procedures were investigated in an effort to restore product water flux after fouling of the membrane surface with oil. Preliminary designs for low-pressure systems to produce 100 and 1000 gpm of oil-free product were developed, based on a spiral-wound modular system. A summary of limitations and constraints of a proposed 100-gpm system for shipboard application is presented, along with spatial, weight, and energy requirements and economic factors for such a system. (Knapp-USGS)
W74-06360

WATER-QUALITY ASPECTS OF GROUND-WATER RECHARGE IN ISRAEL,
Ministry of Agriculture, Tel-Aviv (Israel). Water Pollution Control Univ.
J. Goldshmid.
Journal of the American Water Works Association, Vol 66, No 3, p 163-166, March 1974. 1 fig, 3 tab, 7 ref.

Descriptors: *Artifical recharge, *Water quality, *Water treatment, *Injection wells, Water pollution sources, Coliforms, Algae, Biodegradation, Organic matter, Chlorination, Potable water, *Waste water treatment.
Identifiers: *Israel.

Because of the differences in rainfall and water needs in northern and southern Israel, a method of recharging groundwater and transporting it from the north to the south is used. Most of the water is recharged in the Pleistocene sandy aquifer of the coastal plain and in the Karstic Turonian-Cenomanian aquifer at the foothills of Judea and Samaria. Most of the water is recharged into the aquifer through dual-purpose wells (pumping as well as recharging). Water pumped from a recharge well after a pause period has a septic odor. It usually takes from several hours to one day for the pumped water to become odor free. The treated water contains on the average an algal concentration of 400 asu/ml and MPN less than 2/100 ml. During recharge the sand around the well casing filters the organic debris and the residual bacteria. The bacteria adhere strongly to the sand and do not disperse into the aquifer. When the recharge is stopped, the bacteria multiply, using the accumulated organic debris for food. The decomposition of the organic matter starts as an aerobic process. After all the oxygen has been consumed, it turns anaerobic and septic. After about 100 days from the end of the recharge, the decomposition process ends and no more coliform bacteria are found in the pumped water. When pumping starts before the end of the decomposition process, the water is turbid and septic with high coliform counts. To overcome the problem all the water pumped from recharge wells is chlorinated. Chlorination continues until the water pumped from the well meets the bacteriological drinking-water standards. (Knapp-USGS)
W74-06363

RENOVATING MUNICIPAL WASTEWATER BY HIGH-RATE INFILTRATION FOR GROUND-WATER RECHARGE,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
H. Bouwer.
Journal of the American Water Works Association, Vol 66, No 3, p 159-162, March 1974. 3 fig, 11 ref.

Descriptors: *Water reuse, *Tertiary treatment, *Artificial recharge, *Arizona, Water spreading, Infiltration, Alluvial channels, Reclaimed water, *Waste water treatment.
Identifiers: *Phoenix(Ariz), Salt River Basin(Ariz).

A pilot project in the Salt River bed west of Phoenix, Arizona, showed that secondary-sewage effluent can be renovated effectively by groundwater recharge with high-rate infiltration basins. Essentially complete removal of BOD, suspended solids, and fecal coliforms was obtained, and nitrogen and phosphate were reduced. To renovate the present flow of about 3.5 cu m per s of the two Phoenix treatment plants, about 120 ha of infiltration basins would be required. This would increase to about 360 ha if the flow of 10.5 cu m per s, projected for the year 2000, were to be renovated. The infiltration basins could be located along both sides of the Salt River bed, and the renovated water could be pumped from wells in the center of the riverbed. Such a system would produce renovated water of more than sufficient quality to permit unrestricted irrigation and recreation. The total cost of putting the effluent underground and of pumping it up as renovated water in the Salt River bed is estimated at about $3.30 per ha-m. This is much less than the cost of equivalent treatment in a tertiary treatment plant. (Knapp-USGS)
W74-06364

PROCESS FOR RECOVERING FOREST PRODUCT PLANT WASTES,
R. E. S. Thompson.
Typescript, Jan 1, 1974. 13 p, 1 fig, 7 claims.

Descriptors: *Patents, Pollution abatement, Pulp and paper industry, *Wood wastes, *Solid wastes, Waste disposal, *Activated carbon, Saw mills, Sawdust, *Incineration, Filters, Filtration, *Pulp wastes, *Waste treatment, Air pollution, Water pollution control, Steam, Waste water treatment, Recycling, Effluents, Industrial wastes, Treatment facilities.
Identifiers: Furnaces, Carbonization, Pyrolysis, Gas scrubbing, Flue gases, Briquets, Steam generators, Chemical recovery, Forest products industry.

A method is described (Patent No. 3,783,128) for the closed-circuit processing of all waste products from pulp and paper mills or other forest-products enterprises without air or water pollution. Solid wastes, notably bark, wood chips, and sawdust, are carbonized to a char, at least a portion of which is treated in a second furnace to produce activated carbon, the remainder being sold in briquetted form. The activated carbon is used as a filter medium for aqueous factory effluents which can be recycled after solids removal. The carbon and entrained solids are recycled to one of the furnaces. Off-gases from all furnaces are passed to a boiler for steam generation, and the spent gas can be passed through an absorber (gas scrubber) before final release. (Lynch-IPC)
W74-06378

WATER AND WASTE WATER MANAGEMENT IN THE MANUFACTURE OF STRUCTURAL FIBERBOARDS IN POLAND (ZAGADNIENIA GOSPODARKI WODNOSCIEKOWEJ PRZEMYSLU PLYT PILSNIOWYCH NA TLE GOSPODARKI WODNEJ W POLSCE),
A. Dudzinski, and W. Onisko.
Przeglad Papierniczy, Vol 29, No 7, p 260-263, July 1973. 2 fig, 2 tab, 13 ref.

Descriptors: *Waste water treatment, *Pulp wastes, Europe, *Industrial water, *Pollution abatement, *Water reuse, Water consumption, Irrigation, Soil disposal fields, Rivers, Waste treatment, Industrial wastes, Recirculated water, Water pollution control, Effluents, Waste disposal, Coagulation, Sedimentation, Pulp and paper industry.
Identifiers: *Poland, Building boards, Fisherboards, Hardboards, Insulation boards.

Industrial water consumption in Poland is still below the estimated permissible maximum of 30 cu km/year, but increasing steadily and evidencing some local shortages. The wood-processing industry accounts for only 6.1% of total industrial consumption, and the fiberboard (building board) industry a small fraction thereof. Hence no Polish fiberboard factory has yet suffered from lack of water supply, despite their relatively high specific consumption per ton of board produced. Most fiberboard factories purify their effluents, albeit inadequately, except at Czarna Woda, where effluents are diluted with river water and disposed of by soil irrigation. Pollution of the Wda River has been remedied. Effluent treatment methods are selected according to local conditions, but a more uniform management approach is in evidence. Of the two discernible trends, one involves reduction of water consumption (by improved technology and recirculation) from 41 to 10-20 cu m per ton, followed by effluent purification. The other shows a greater reduction (to 1-5 cu m/ton), followed by combustion of wastes. Two recent treatment methods are gaining in favor. The Finnish Savo process is based on coagulation, sedimentation, and recycling of purified effluent. The other is a Swedish process, in which effluents are subdivided into highly polluted and less polluted portions by means of a DKP or Davenport press, and the streams are treated separately. (Stapinski-IPC)
W74-06380

CALCULATION OF FRESHWATER CONSUMPTION (NALADIT' UCHET RASKHODA SVEZHEI VODY),
G. E. Gal'per, and Ya. V. Nikitin.
Bumazhnaya Promyshlennost', No 8, p 17-18, Aug 1973.

Descriptors: *Water consumption, *Industrial water, Freshwater, *Pulp and paper industry, *Pulp wastes, Effluents, Discharge(Water), Europe, Foreign countries, Regulation, Legislation, Water law, Water management(Applied), *Water reuse, *Recycling.
Identifiers: *USSR, Silvichemical industry, Forest products industries, Reporting accountability.

The Soviet pulp, paper, and silvichemical industries consume nearly 10 million cu m of water daily, of which 70% is used by the 21 leading factories accounting for 50% of total industry production. The coefficient of recycled water utilization averages 0.54 and is 0.74 for the 21 leading plants. Effluent discharge volumes are 92-95% of the freshwater consumed. Most mills consume or exceed the upper limits allowed by USSR standards which permit 20-27 cu m/ton for groundwood and up to 1200-3300 cu m/ton of capacitor paper (which must be washed free of electrolytes). Mill records, if kept at all, show only overall water consumptions and effluent discharges, but not for individual manufacturing steps or processes. A recently issued government regulation specifies not only the permissible water use per ton of various products, but also the volume allowed in various processing stages, such as pulpwood preparation, cooking liquor preparation, pulp screening and cleaning. Henceforth all pulp and paper mills and wood-processing factories will be required to keep detailed records and submit reports on water consumption figures, as well as to install water meters on all supply lines. These measures are hoped to reduce freshwater and effluent volumes substantially throughout the industry. (Stapinski-IPC)
W74-06381

AN EFFECTIVE METHOD FOR THE ISOLATION OF FISH-TOXIC ORGANIC SOLUTES FROM PULP MILL EFFLUENTS,
Western Forest Products Lab., Vancouver (British Columbia).
I. H. Rogers, J. A. Servizi, and R. W. Gordon.
Bimonthly Research Notes, Vol 28, No 4, p 24-25, July-August, 1972. 3 ref.

Descriptors: *Separation techniques, Pollutant identification, Fish, *Toxicity, *Isolation, *Bioassay, *Pulp wastes, *Waste water treatment, *Color, *Ion exchange, Waste treatment, Pulp and paper industry, Salmon, Sockeye salmon, Solvent extractions, Analytical techniques, Waste water(Pollution), Pollutants, Organic compounds.
Identifiers: Methanol(Methyl alcohol), Kraft mills, Chemical recovery.

A procedure for quantitatively recovering toxic organic components from kraft pulp mill waste waters involves pre-extraction of Amberlite XAD-2 resin with methanol to remove low-molecular-weight contaminants, then passing a 5-gal sample of the aqueous waste through the resin column, collecting the effluent, and conducting a bioassay with sockeye salmon fry. The column is washed with 5 liters of 0.05N NaOH solution plus 5 liters of water. The alkaline extract and wash water are combined, neutralized, and bioassayed after dilution to the same concentration as the original waste water sample. The column is then stripped with 3 liters of methanol, the methanol is evaporated under vacuum, and the residue is dissolved in 100 ml of water. The toxic compounds are recovered almost quantitatively in the methanol fraction. For color removal, the methanol fractions are extracted with ether in a liquid-liquid extractor. The pale yellow oils recovered can be separated by chemical methods to identify the compounds responsible for fish toxicity. (Witt-IPC)
W74-06382

WATER USAGE IN THE BRITISH PAPER AND BOARD INDUSTRY,
Research Association for the Paper and Board, Printing and Packaging Industries, London (England). Paper and Board Div.
A. B. Truman, and R. D. Isabell.
Paper (London), Vol 179, No 4, p 177-178, Feb 21, 1973.

Descriptors: *Industrial water, *Water conservation, *Pulp and paper industry, Water treatment, *Costs, *Water consumption, Pollution abatement, Water pollution control, Europe, Freshwater, Effluents, Discharge(Water), *Waste water treatment.
Identifiers: *United Kingdom.

A questionnaire survey of British paper and board mills indicated average freshwater consumptions of 145 cu m or 31,000 gal per ton of pulp. Different mills reported values ranging from 1 to 700 cu m (200-150,000 gal) per ton, but 90% of the mills surveyed indicated less than 120 cu m (25,000 gal) per ton. Freshwater supplies in the U.K. are becoming scarcer, while effluent discharge requirements are getting stricter. Costs of effluent treatment and sludge disposal are high. Hence it is essential that all mills minimize their water consumption to reduce both production costs and environmental pollution. Methods of achieving reductions in freshwater demand and water treatment costs are discussed. (Witt-IPC)
W74-06383

CAN SCREENED WHITE WATER BE RECYCLED TO SHOWER FELTS,
Trent Valley Paperboard Mills (Ontario).
B. B. Renshaw.
Pulp and Paper Magazine of Canada, Vol 74, No 11, p 40, 42, 44, Nov 1973. 3 fig, 1 tab.

Descriptors: *Water reuse, *Recirculated water, *Screens, *Filtration, Filters, *Pulp wastes, *Industrial water, Water conservation, Water circulation, Pulp and paper industry, Suspended solids, Freshwater, River water, Waste water treatment, Particle shape, Particle size.
Identifiers: Shower water, Board machines, Cylinder board machines, Paperboard mills, *White water(Paper machine), Felts(Papermaking), Showers(Paper machine).

At Trent Valley Paperboard Mills, white water from two six-vat cylinder board machines making over 100 tons/day of uncoated boxboards will be passed through Sweco concentrators (rotary vertical screen baskets), and the filtered water will be reused in felt-cleaning showers. This partial closing of the machine's water circuits is expected to save significant volumes of freshwater while reducing the clarifier load by 400 gal/min or more. Initial trial runs with the Sweco screen indicated that the reusability of the white water was governed not so much by the quantity of suspended particles (up to a certain limit) as by their size and shape, the smaller uniform particles causing no shower clogging problems. No significant felt plugging or picking was observed with screened white water (that had passed through a saveall), compared to river water. (Brown-IPC)
W74-06384

THE ANTI-POLLUTION SEQUENCE - A NEW ROUTE TO REDUCED POLLUTANTS IN BLEACH PLANT EFFLUENT,
Hooker Chemical Corp., Niagara Falls, N.Y.
R. J. Gall, and F. H. Thompson.
Tappi, Vol 56, No 11, p 72-76, Nov 1973. 4 fig, 25 ref, 7 tab.

Descriptors: *Waste water treatment, Pollution abatement, Water pollution control, *Pulp wastes, *Bleaching wastes, Pollutants, Effluents, Pulp and paper industry, *Chlorination, Chlorine, Economics, Costs, *Color, Chlorides, Chemical oxygen demand, Biochemical oxygen demand, Water pollution sources.
Identifiers: Hypochlorites, Bleach plants, Pulp bleaching, Chemical consumption.

Substantial reduction in effluent color and moderate reductions in chlorides, COD, and BOD have been achieved by the restructuring of conventional pulp bleaching sequences. Sequential chlorination has replaced conventional chlorination, and hypochlorination was substituted for the first alkaline extraction stage. This antipollution sequence (APS) utilizes existing bleach plant chemicals and available or slightly modified bleach plant equipment. The process is adaptable to both softwood and hardwood pulps. The pollutant reductions achieved required equivalent or slightly higher than usual chemical costs. (Brown-IPC)
W74-06385

BELLMER CONVERGING DOUBLE-BELT PRESS, AN INTERESTING MACHINE FOR SLUDGE DEWATERING (DIE BELLMER-WINKELPRESSE, EIN INTERESSANTES GERAET FUER DIE SCHLAMMENTWAESSERUNG).
Das Papier, Vol 27, No 8, p 357-358, Aug 1973. 1 fig, 3 tab.

Descriptors: *Dewatering, *Sludge treatment, *Treatment facilities, *Equipment, Pulp wastes, Sewage treatment, Municipal wastes, Industrial wastes, Waste treatment, *Waste water treatment.
Identifiers: *Bellmer dewatering press, Germany.

The dewatering press described and illustrated is marketed by Gebrueder Bellmer KG, Niefern, West Germany, and comprises essentially two plastic wire screens circulating around rotating cylinders. Performance data for municipal (sewage) and industrial (paper mill) sludges are given, along with some capital and operating cost data. (Speckhard-IPC)
W74-06386

PRACTICAL APPROACH TO WATER CONSERVATION IN A PAPER MILL,
Papeteries Boucher, Calais (France).
J. J. Wilkinson.
Pulp and Paper International, Vol 15, No 5, p 59-62, May 1973. 1 fig, 3 tab.

Descriptors: *Water conservation, *Industrial water, *Pulp and paper industry, *Water reuse, *Recirculated water, *Water consumption, Water circulation, Lubrication, Cleaning, Operation and maintenance, Design, Equipment.
Identifiers: Wash water, Shower water, Showers(Paper machine), Felt conditioners, Paper machines.

Although the pulp and paper industry has made considerable progress in reducing its water consumption, much more can be achieved by using modernized methods and equipment. The use of water for washing, general cleaning, felt conditioning, wire showers, and lubrication of shaft packing boxes is discussed. Careful attention to details of mill design, including proper selection of auxiliary equipment, provisions for greater reuse of water, and machine operation, can contribute to substantial further reductions in specific water consumption to manufacture a ton of paper. (Hansen-IPC)
W74-06387

SOME PROBLEMS ASSOCIATED WITH WATER REUSE,
Betz Labs., Inc., Trevose, Pa.
B. S. Shema.
American Paper Industry, Vol 55, No 9, p 31-33, Sept 1973. 6 fig.

Descriptors: *Water reuse, *Recirculated water, *Pulp and paper industry, *Water conservation, Recycling, Slime, Corrosion, Algae, Bacteria, Aquatic organisms, Resins, Water circulation, Water chemistry, Effluents, Discharge(Water), Industrial water, Freshwater, Microorganisms, Operation and maintenance.
Identifiers: Pitch, Wood resins, Paper machines.

Common sense and environmental concerns dictate that water should be reused as often as possible. Benefits derivable from a closed water circulation system in paper mills include conservation of freshwater, chemicals, and heat, and reduced volumes of discharged effluent. Problems associated with water reuse may include machine operating difficulties, such as corrosion, scale and microbiological deposits, pitch troubles (due to accumulation of wood resins), and algal or bacterial slimes. All of these problem areas are discussed, and possible countermeasures are indicated. (Wise-IPC)
W74-06388

DEWATERING OF BIOLOGICAL-CHEMICAL PAPER MILL WASTE WATER SLUDGE WITH THE 'SYSTEM HILLER' KHD CENTRIFUGE (ENTWAESSERUNG VON BIOLOGISCH-CHEMISCHEM PAPIERFABRIKSABWASSER-SCHLAMM MIT DER KHD-ZENTRIFUGE 'SYSTEM HILLER'),
Cellulose Attisholz A.G., Luterbach (Switzerland).
A. Scherler.
Wochenblatt fuer Papierfabrikation, Vol 100, No 20, p 739-743, October 31, 1972. 3 fig, 2 tab.

Descriptors: Treatment facilities, *Sludge treatment, *Waste water treatment, *Separation techniques, *Dewatering, *Centrifugation, *Pulp wastes, Europe, Equipment, Energy, Maintenance, Flocculation, Centrifugal pumps.
Identifiers: *Switzerland, KHD centrifuge, Centrifuges, Biberist Papierfabrik(Switzerland).

The design, operating principle, and capital and operating costs of the KHD (Klockner-Humboldt-Deutz) centrifuge are outlined. Particular ad-

vantages claimed for this apparatus in dewatering sludge from pulp and paper mill effluent treatment include compactness, low noise level, high wear resistance, economic energy consumption, low maintenance needs, metered dosage of flocculant and hence chemical savings, and operating flexibility. After preliminary laboratory evaluations, with encouraging results, a commercial unit was constructed and installed at the Biberist Papierfabrik in Switzerland. (Speckhard-IPC)
W74-06392

RECENT ADJUSTMENTS IN WATER USE AND TREATMENT BY U.S. MANUFACTURERS,
Urban Inst., Washington, D.C.
R. J. Struyk.
Water Research, Vol 7, No 6, p 911-925, June 1973. 2 tab, 4 ref.

Descriptors: Economic impact, *Water reuse, Water treatment, *Industrial water, *Water utilization, *Prices, *United States, Pulp and paper industry, Surveys, Statistical methods, *Waste water treatment.

Statistical data of two kinds are provided concerning trends in water reuse and water treatment by U.S. manufacturers: (A) A display and discussion of water use trends during 1964-1968 in the largest water-using industries indicates sizeable adjustments in reuse and treatment as a whole and for individual industry segments. (B) The extent to which observed adjustments are viewable as responses to changes in the price of industrial water supplies is evaluated by price/quality and price/treatment relations, based on regional observations in four major water-using industries, including the pulp and paper sector. Results indicate this analytical approach to be promising, but the data do not suffice to permit reliable quantification of the effects of individual price variables. (Witt-IPC)
W74-06395

PULP AND PAPER MILL SLUDGE DISPOSAL BY COMBUSTION,
Crown Zellerbach Corp., Camas, Wash.
A. S. Rosenfeld, T. R. Aspitarte, and H. R. Amberg.
Tappi, Vol 56, No 10, p 97-100, Oct 1973. 2 fig, 8 tab.

Descriptors: *Sludge disposal, *Incineration, *Pulp wastes, *Costs, *Operating costs, Ultimate disposal, Industrial wastes, Waste disposal, Pulp and paper industry, Equipment, Air pollution, Economic efficiency, Waste treatment.
Identifiers: Furnaces, White waters.

The combustion of fibrous sludge from paper mill white waters is a low-pollution disposal method, since proper operation of incineration equipment can meet present air quality standards. The cost of combustion in an air-entrained dryer-incinerator is ca. $13.00 per ton of (dry) sludge; incineration in a hog-fuel boiler would cost ca. $11.50 per oven-dry ton. (Brown-IPC)
W74-06397

COLOR REMOVAL PROCESS.
Pulp and Paper International, Vol 15, No 5, p 69, May 1973. 1 fig.

Descriptors: *Waste water treatment, *Color, *Pulp wastes, *Foreign research, Europe, *Canada, *Polymers, Flocculation, Coagulation, Chemical oxygen demand, Biochemical oxygen demand, Organic compounds, Economic feasibility.
Identifiers: Amines, Polyamines, Amino resins, Kraft mills.

A method developed and patented in France for decoloring pulp mill effluents involves contacting the main color-carrying streams with high-molecular-weight amines in a water-immiscible solvent. The process removes 90-98% of the color, 45-85% of the COD, and 30-70% of the BOD from the effluents. The amines can be regenerated and recirculated. Small-scale tests in a kraft mill gave results as good as did laboratory trials at the Pulp and Paper Research Institute of Canada. They will be followed by economic feasibility studies and larger-scale trials. (Hansen-IPC)
W74-06399

WORLD'S LARGEST DEEP AERATED STABILIZATION BASIN IN NEW ZEALAND,
New Zealand Forest Products Ltd., Kinleith.
J. L. Vickerman, and H. W. Gehm.
Paper Trade Journal, Vol 157, No 28, p 24-26, July 9, 1973. 5 fig, 3 ref.

Descriptors: *Aeration, *Pulp wastes, *Waste water treatment, Engineering structures, Dams, *Oxidation lagoons, *Aerated lagoons, Valleys, Streams, River basins, Effluents, Industrial wastes, Waste treatment, Lakes, Pollution abatement, Pulp and paper industry, Australia, Oxygen, Oxygenation.
Identifiers: *New Zealand, Kraft mills, Aerators, Lake Maraetai(New Zealand).

In connection with the expansion of a bleached kraft pulp and paper mill, New Zealand Forest Products Ltd. at Kinleith, N.Z., created a 55 ft deep waste water stabilization basin by constructing a 60 ft high dam across the stream valley which carries the mill's effluents to Lake Maraetai. The aeration basin should provide a detection period of 4.5 days and is equipped with ten down-draft aerators, each of 50-hp capacity, for a total daily aeration performance of 30,000 lb of oxygen. (Hansen-IPC)
W74-06401

ELECTROCHEMICAL PURIFICATION OF INDUSTRIAL EFFLUENTS (ELEKTROKHIMICHESKAYA OCHISTKA PROMYSHLENNYKH STOCKNYKH VOD),
A. P. Tomilov, I. M. Osadchenko, and N. Sh. Fuks.
Khimicheskaya Promyshlennost', Vol 48, No 4, p 267-270, 1972. 51 ref.

Descriptors: *Electrochemistry, *Reviews, *Waste water treatment, *Industrial wastes, Pollutants, Water pollution sources, *Pulp wastes, Textiles, Dyes, Organic compounds, Phenols, Phosphorus compounds, Nitrogen compounds, Economics, Costs.
Identifiers: Fatty acids, Aliphatic acids, Carboxylic acids, Cyanides, Azo dyes, Triazine dyes, Reactive dyes, Viscose rayon.

A review is presented of electrochemical methods for the removal of various pollutants from industrial waste waters, including cyanides, phenols, sulfur compounds, and phosphorous compounds. Among industrial wastes discussed in particular are effluents from pulp and paper mills, viscose rayon factories, azo and triazine dye manufacture, and the production of synthetic fatty acids. Economic considerations are also mentioned. (Chern-IPC)
W74-06402

LIQUID-PHASE OXIDATION OF PHENOL, METHANOL, AND FORMALDEHYDE FOR PURIFICATION OF INDUSTRIAL EFFLUENTS (ZHIDKOFAZNOE OKISLENIE FENOLA, METANOLA I FORMAL'DEGIDA PRIMENITEL'NO K OCHISTKE STOCHNYKH VOD),
I. S. Stepanyan, I. A. Vinokur, and G. M. Padaryan.
Khimicheskaya Promyshlennost', Vol 48, No 6, p 430-431, 1972. 7 fig, 7 ref.

Descriptors: Pollutants, *Oxidation, *Pulp wastes, *Industrial wastes, *Waste water treatment, *Phenols, Alcohols, Organic compounds, Aqueous solutions, Waste treatment, Pollution abatement, Chemical oxygen demand, Laboratory equipment, Laboratory tests, Foreigh research.
Identifiers: *Formaldehyde, *Methanol(Methyl alcohol), USSR.

Batch-process oxidations in a laboratory apparatus were conducted on aqueous solutions of phenol, methanol, and formaldehyde, separately and in binary and ternary mixtures, at 200 C and 40 atm pressure. After 1.5 hr, the COD levels were reduced by 94.7% for phenol, 76.8% for methanol, and 92.7% for formaldehyde. The COD of the original ternary mixture, which was 60,000 mg of oxygen/liter, was reduced by 80% in 1 hr. (Chern-IPC)
W74-06403

BIOLOGICAL WASTEWATER TREATMENT SYSTEM DESIGN. PART I. OPTIMAL SYNTHESIS,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
P. M. Mishra, L-T. Fan, and L. E. Erickson.
Canadian Journal of Chemical Engineering, Vol 51, No 6, p 694-701, Dec 1973. 2 fig, 1 tab, 45 ref.

Descriptors: *Systems analysis, *Optimization, *Biological treatment, *Waste water treatment, *Trickling filters, *Activated sludge, *Aeration, Treatment facilities, Design, Design criteria, Design data, Waste treatment, Mathematical models, Simulation analysis, Costs, Cost-benefit analysis, Mathematical studies.
Identifiers: Clarifiers, Secondary treatment, Process variables.

Common practice for design of biological waste water treatment systems involves the evaluation of certain fixed structure systems at several alternative conditions. The structural parameter system synthesis technique was used to optimize both the structure and the design of a system comprising a trickling filter, an activated sludge aeration vessel, and a secondary clarifier. Results of optimal synthesis indicated that the activated sludge system was the most cost-effective system for the specific set of process parameters examined. The same conclusion was reached by optimizing several systems with different structures. (See also W74-06408) (Brown-IPC)
W74-06407

BIOLOGICAL WASTEWATER TREATMENT SYSTEM DESIGN. PART II. EFFECTS OF PARAMETER VARIATIONS ON OPTIMAL PROCESS SYSTEM STRUCTURE AND DESIGN,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
P. N. Mishra, L-T. Fan, and L. E. Erickson.
Canadian Journal of Chemical Engineering, Vol 51, No 6, p 702-708, Dec 1973. 10 fig, 1 tab, 8 ref.

Descriptors: *Biological treatment, Systems analysis, *Optimization, Treatment facilities, *Activated sludge, *Trickling filters, *Aeration, *Waste water treatment, Design, *Design criteria, Design data, Waste treatment, Mathematical models, Simulation analysis, Mathematical studies, Costs, Cost-benefit analysis.
Identifiers: Clarifiers, Secondary treatment, Process variables.

The effects of varying the feed concentration and rate constants on the optimal structure and design of a biological effluent treatment systems comprising a trickling filter, an activated sludge aeration vessel, and a secondary clarifier were investigated. The system was synthesized computationally for different sets of parameter values, and the corresponding changes in system structure and design were evaluated. The results indicated that

the optimal structure and design are sensitive to variations in both rate constants and feed concentration. Some innovative process flowcharts having surprisingly low total costs were deduced. In certain cases, capital costs of combined systems are lower than those using a single (activated sludge) unit to perform the same task. Major advantages of installing a trickling filter ahead of an activated sludge unit involve a smoothing out of the organic loading and a reduction of plant performance interruptions. Owing to an inadequate model for the secondary clarifier, the effect of its operating parameter variations has not yet been investigated. (See also W74-06407) (Brown-IPC)
W74-06408

MINE WATER PURIFICATION BY REVERSE OSMOSIS,
Lakehead Univ., Thunder Bay (Ontario). School of Engineering.
R. G. Rosehart.
Canadian Journal of Chemical Engineering, Vol 51, No 6, p 788-789, Dec 1973. 2 fig, 2 tab, 2 ref.

Descriptors: *Reverse osmosis, Desalination, *Mine water, *Mine drainage, *Waste water treatment, *Treatment facilities, Membrane processes, Membranes, Arsenic compounds, Calcium, Zinc, Mine wastes, Potable water, Hydrogen ion concentration, Pilot plants.
Identifiers: *Cyanides, Cellulose acetate, Hollow-fiber membranes.

A small reverse osmosis (R.O.) pilot plant was constructed and tested first on copper sulfate solutions. Its use for removing dissolved arsenic from acid mine drainage water gave encouraging results with conventional cellulose acetate membranes. On the other hand, the recovery of alkaline barren solutions (containing Ca, Zn, and cyanide ions) from gold-processing wastes was unsatisfactory, even with hollow-fiber membranes. The R.O. process seemed ideal, however, for demineralization of drinking water. (Brown-IPC)
W74-06409

SCREENING AND SELECTION OF SOLVENTS FOR EXTRACTION OF PHENOL FROM WATER,
Toronto Univ. (Ontario). Dept. of Chemical Engineering.
P. R. Kiezyk, and D. Mackay.
Canadian Journal of Chemical Engineering, Vol 51, No 6, p 741-745, Dec 1973. 1 fig, 1 tab, 23 ref.

Descriptors: *Phenols, *Waste water treatment, *Solvents, *Solvent extractions, *Separation techniques, Thermodynamic behavior, Aqueous solutions, Solubility, Ethers, Alcohols, Organic compounds, Industrial wastes, Effluents, Toxicity, Biodegradation, Molecular structure.
Identifiers: Esters, Ketones, Functional groups.

Experimental data on the distribution coefficients of phenol between two solvents show considerable variations at low phenol concentrations. Hence it is essential to obtain such data over the entire concentration range so as to avoid extrapolations from higher to lower concentrations. Experimental and literature data for phenol distributions between water and 26 solvents were correlated successfully, based on thermodynamic considerations. The solution theory used takes into account polar interactions and provides an interaction energy term that depends on the functional groups present in the solvent molecules. Although the accuracy of this approach is insufficient for system design purposes, it suffices for the screening of solvents suitable for phenol extraction from waste waters. The preferred solvents include ethers, esters, ketones, and alcohols, not only because of their favorably high distribution coefficients, but also because of their relatively low toxicity and higher biodegradability. The use of such solvents mixed with an inert solvent is an attractive practical possibility for phenol removal from aqueous industrial effluents. (Brown-IPC)
W74-06410

ACTIVATED CARBON ADSORPTION AND POLISHING OF STRONG WASTEWATER,
New York State Dept. of Environmental Conservation, Albany.
T. J. Tofflemire, L. J. Hetling, and W. W. Shuster.
Journal Water Pollution Control Federation, Vol. 45, No. 10, p 2166-2179, Oct 1973. 3 fig, 7 tab, 37 ref.

Descriptors: *Adsorption, *Activated carbon, *Waste water treatment, *Sewage treatment, *Industrial wastes, *Domestic wastes, *Pulp wastes, Waste treatment, Pilot plants, Laboratory equipment, Hydrogen sulfide, Anaerobic conditions, Filtration, Chemical oxygen demand, Color, Dyes, Flow rates, Operation and maintenance.

A small laboratory adsorption unit, a pilot plant, and an upflow column system were compared for purification efficiency of a mixed domestic-industrial waste water. All systems effectively removed color bodies originating from paper dyes. The pilot plant gave the poorest COD removals, probably because of lack of backwashing and prior filtration. Problems in all carbon adsorption systems resulted from high residual COD and from anaerobic conditions with attendant generation of hydrogen sulfide. Other problems with the upflow system included channelling of the flow through the column's bottom portion, and difficulty in backwashing. Prior filtration through sand and the use of high-speed water jets lessened these difficulties. It may be necessary to polish such mixed effluents which often are anaerobic. (Witt-IPC)
W74-06411

SUBMERGED TURBINE AERATORS FOR WASTE WATER TREATMENT,
Philadelphia Mixers Corp., Pa.
R. L. Winter.
Paper Trade Journal, Vol 157, No 38, p 45-47, Sept 17, 1973. 2 fig.

Descriptors: *Treatment facilities, *Aeration, *Waste water treatment, *Turbines, Equipment, Aerated lagoons, Oxidation lagoons, Diffusion, Impellers, Pumps, Mixing, Industrial wastes, Pulp wastes.
Identifiers: Aerators, Compressed air, *Turbine aerators.

Three major types of water aeration equipment and methods are described, including diffuse air, surface agitation, and submerged turbine aerators. Factors involved in selecting the most appropriate system for increasing the dissolved oxygen content of waste waters are discussed. Experience has shown that submerged turbine aeration units are highly effective in dispersing oxygen throughout an aeration basin. Actually this method combines the diffused-air and the surface-agitation principles. Compressed air is introduced under pressure to the bottom of the basin by means of a diffuser. An impeller positioned just above the diffuser assures thorough mixing of air and water. (Witt-IPC)
W74-06412

CONSOLIDATED INSTALLING ONE WASTE TREATMENT PLANT FOR THREE PLANTS.
Paper Trade Journal, Vol 157, No 32, p 29, Aug. 6, 1973.

Descriptors: *Treatment facilities, *Wisconsin, *Pulp wastes, *Water pollution treatment, *Waste water treatment, Pulp and paper industry, Effluents, Aerated lagoons, Lagoons, Aeration, Pumps, Pipelines.
Identifiers: Clarifiers, Wisconsin Rapids(Wis.)

Consolidated Papers, Inc., recently started construction of a waste water treatment installation to serve its three company divisions located near Wisconsin Rapids, Wisconsin. Production facilities include a groundwood, a waste paper-processing, a kraft pulp, a paperboard, and two white paper mills. The treatment plant will include lift pumping stations at each of the three company divisions, a system of pipelines to convey the effluents to the treatment plant, two primary clarifiers, an aeration lagoon, and two final clarifiers. This installation will handle a total effluent flow of ca. 22.8 million gal per day. (Witt-IPC)
W74-06413

WATERVLIET PAPER COMPLETES WASTE WATER DISPOSAL SYSTEM.
Southern Pulp and Paper Manufacturer, Vol 36, No 8, p 26-28, Aug. 1973. 1 illus.

Descriptors: *Pulp wastes, *Waste water disposal, Ultimate disposal, *Michigan, Irrigation, *Soil disposal fields, Spraying, Pipelines, Grasslands, Water supply, Pulp and paper industry, Rivers, Waste disposal, Suspended solids, Screens, Filtration, Waste water(Pollution), Pollution abatement, Effluents.
Identifiers: Paw Paw River(Mich), Watervliet(Mich), Reeds, Canary reed, *Spray irrigation.

At Watervliet, Michigan, the Watervliet Paper Co., (a division of Hammermill Paper Co.) disposes of ca. 1 million gal/day of mill effluent by spray irrigation. A pipeline 1.4 mile long delivers the waste water to the irrigation field where it is sprayed onto 11-acre zones in 10-hr rotation periods. Preliminary screening of the waste water removes all but 0.01% of the suspended solids. The irrigation field is planted with water-thriving Canary reed grass, which keeps the surface soil loose and promotes drainage to the underlying sand strata. The paper mill draws all its water supply from wells and places no load on the nearby Paw Paw River for either supply or disposal. (Hansen-IPC)
W74-06415

CONDITIONING AND DISPOSAL OF SOLIDS FROM POTATO WASTEWATER TREATMENT,
CH2M/Hill, Corvallis, Oreg.
G. A. Richter, K. L. Sirrine, and C. I. Tollefson.
J Food Sci. Vol 38, No 2, p 218-224, 1973. Illus.
Identifiers: *Idaho, *Potato processing wastes, *Sludge disposal, Snake River(Ida), *Waste water treatment, Tertiary treatment, Aerobic digestion, Dewatering, Waste disposal, Solid wastes.

Aerobic biological secondary treatment of primary clarified potato processing wastewater in Shelley, Idaho yields biological solids in excess of that needed to operate the treatment system. In the past, these diluted biological solids were discharged into the Snake River or dewatered along with silt water(at a high chemical cost) and used as landfill. A study was conducted during the 1970-71 potato processing season to investigate alternative methods of waste biological solids conditioning and disposal. A pilot scale spray field and pilot scale equipment, including a basket centrifuge and aerobic digester, were used during the study. Operation of a waste biological solids spray irrigation system at reasonable application rates should not produce objectionable odors; successful operation will require prescreening and special sprinkler heads for freezing weather application. Basket centrifuges are effective for concentrating waste biological solids from aerobic biological treatment systems with sludge volume indexes up to and over 250. Fifteen days aerobic digestion substantially improves the dewaterability of the waste biological solids at 16C.--Copyright 1973, Biological Abstracts,Inc.
W74-06486

5E. Ultimate Disposal Of Wastes

RECYCLING MUNICIPAL SLUDGES AND EFFLUENTS ON LAND.
For primary bibliographic entry see Field 5D.
W74-05963

FEDERAL AND STATE LEGISLATIVE HISTORY AND PROVISIONS FOR LAND TREATMENT OF MUNICIPAL WASTEWATER EFFLUENTS AND SLUDGES,
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 6E.
W74-05964

LAND APPLICATION OF WASTEWATER WITH A DEMOGRAPHIC EVALUATION,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-05965

SOME EXPERIENCES IN LAND ACQUISITION FOR A LAND DISPOSAL SYSTEM FOR SEWAGE EFFLUENT,
Muskegon County Board, Mich. Dept. of Public Works.
For primary bibliographic entry see Field 5D.
W74-05966

A REGIONAL VIEW ON THE USE OF LAND FOR DISPOSAL OF MUNICIPAL SEWAGE AND SLUDGE,
Environmental Protection Agency, Chicago, Ill. Region V.
For primary bibliographic entry see Field 5D.
W74-05969

SOIL-PLANT RELATIONSHIPS (SOME PRACTICAL CONSIDERATIONS IN WASTE MANAGEMENT),
Illinois Univ., Urbana.
For primary bibliographic entry see Field 5D.
W74-05977

RECYCLING URBAN EFFLUENTS ON LAND USING ANNUAL CROPS,
Arizona Univ., Tucson. Dept. of Agronomy and Plant Genetics.
For primary bibliographic entry see Field 5D.
W74-05980

ENGINEERING AND ECONOMICS OF SLUDGE HANDLING,
Bauer Engineering, Inc., Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-05981

INSTITUTIONAL OPTIONS FOR RECYCLING URBAN SLUDGES AND EFFLUENTS ON LAND,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-05985

PUBLIC ACCEPTANCE--EDUCATIONAL AND INFORMATIONAL NEEDS,
Purdue Univ., West Lafayette, Ind.
For primary bibliographic entry see Field 5D.
W74-05986

ALLUVIAL GROUND WATER QUALITY ALTERATION AS RELATED TO SOLID WASTE DISPOSAL SITES IN IOWA, PART I: TEXT; PART II: APPENDIX,
Iowa State Univ., Ames. Dept. of Earth Sciences.
For primary bibliographic entry see Field 5B.
W74-06256

EFFECTS OF WELL INJECTION ON A BASALTIC GHYBEN-HERZBERG AQUIFER,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W74-06264

PROCESS FOR RECOVERING FOREST PRODUCT PLANT WASTES,
For primary bibliographic entry see Field 5D.
W74-06378

PULP AND PAPER MILL SLUDGE DISPOSAL BY COMBUSTION,
Crown Zellerbach Corp., Camas, Wash.
For primary bibliographic entry see Field 5D.
W74-06397

WATERVLIET PAPER COMPLETES WASTE WATER DISPOSAL SYSTEM.
For primary bibliographic entry see Field 5D.
W74-06415

5F. Water Treatment and Quality Alteration

INACTIVATION OF POLIOVIRUS IN WATER BY OZONATION,
Maine Univ., Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-06156

WATER-QUALITY ASPECTS OF GROUNDWATER RECHARGE IN ISRAEL,
Ministry of Agriculture, Tel-Aviv (Israel). Water Pollution Control Univ.
For primary bibliographic entry see Field 5D.
W74-06363

5G. Water Quality Control

LOUISIANA WETLANDS PROSPECTUS.
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
For primary bibliographic entry see Field 2L.
W74-06003

PROTECTING AMERICA'S ESTUARIES: FLORIDA.
Hearings--Subcomm. of Comm. on Government Operations, U.S. House of Representatives, 93d Cong, 1st Sess., May 25, 1973. Parts 1-A and 1-B. 2520 p.

Descriptors: *Federal government, *Decision-making, *Florida, *Estuarine environment, Environmental sanitation, Administration, Adoption of practices, State governments, Legislation, Regulation, Monitoring, Data collection, Dredging, Flood protection, Remote sensing, Coastlines, Harbors, Lakes, Rivers, Water pollution control, Water quality, Water conservation.
Identifiers: *Congressional hearings, *Coastal waters.

Statements were taken from Congressmen, federal officials, state pollution control officials, the Army Corps of Engineers, members of the National Oceanic and Atmospheric Administration, the Game and Fresh Water Fish Commission, and the Environmental Protection Agency. There is an environmental monitoring program in the Florida jetport area. There are programs for the monitoring of biota, noise, fish and wildlife, and hydraulics. Some of this monitoring is done through the use of aerial photographs. Florida contains over 4,200 square miles of water and its bays and indentations make a coastline of almost 8,500 miles. Florida has over 30,000 ponds and lakes and 1,500 miles of streams and rivers, and also possesses a large wildlife population. The hearings sought to determine whether the various federal agencies are carrying out their duties to protect the environmental quality of Florida. Some of the matters to be covered are: the extent to which the wetlands are being destroyed by dredging and filling; the progress in providing adequate treatment for municipal and industrial wastes; the effect of ocean outfalls on ocean resources and human health; efforts to prevent eutrophication of Florida waters; and the adequacy of federal enforcement of pollution control laws. (Sperling-Florida)
W74-06010

HYDROCARBON-OXIDIZING BACTERIA AND THEIR POSSIBLE USE AS CONTROLLING AGENTS OF OIL POLLUTION IN THE OCEAN,
Naval Weapons Center, China Lake, Calif. Research Dept.
For primary bibliographic entry see Field 5B.
W74-06075

APPLICABILITY OF PROGRAMMING MODELS TO PRICING AND RISK CONTROL IN WATER RESOURCE MANAGEMENT,
Pittsburgh Univ., Pa. Graduate School of Business.
For primary bibliographic entry see Field 6A.
W74-06104

HOW EFFECTIVE ARE ENVIRONMENTAL IMPACT STATEMENTS.
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 6G.
W74-06107

EPA REVIEW OF THE EIS,
Environmental Protection Agency, Seattle, Wash.
For primary bibliographic entry see Field 6G.
W74-06110

ENVIRONMENTAL ASPECTS OF THE POWER INDUSTRY,
Portland General Electric Co., Oreg.
For primary bibliographic entry see Field 6G.
W74-06111

EFFECT OF SOME FORMS OF NITROGEN FERTILIZERS ON THE DEVELOPMENT AND CHEMICAL COMPOSITION OF THE FLUE CURED TOBACCO AT DIFFERENT SOIL MOISTURE, (IN POLISH),
Instytut Uprawy Nowozenia i Gleboznawstwa, Pulawy (Poland).
For primary bibliographic entry see Field 3F.
W74-06137

CARBON AND NITROGEN AS REGULATORS OF ALGAL GROWTH,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W74-06166

CONCURRENT RESOLUTION CONCERNING THE ADMINISTRATION OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972.
For primary bibliographic entry see Field 6E.
W74-06180

OPPEN V. AETNA INSURANCE CO. (ACTION FOR DAMAGES TO PLEASURE BOATS RESULTING FROM OIL SPILL DISASTER).
For primary bibliographic entry see Field 6E.
W74-06181

POWERS AND DUTIES OF DEPARTMENT OF FISH AND WILDLIFE.
For primary bibliographic entry see Field 6E.
W74-06184

LAND AND WATER CONSERVATION AND RECLAMATION.
For primary bibliographic entry see Field 6E.
W74-06186

OIL TERMINAL FACILITIES.
For primary bibliographic entry see Field 6E.
W74-06187

SOLID WASTE DISPOSAL.
For primary bibliographic entry see Field 6E.
W74-06191

PROTECTION AND IMPROVEMENT OF WATERS: GREAT PONDS PROGRAM.
For primary bibliographic entry see Field 6E.
W74-06194

NATURAL RESOURCES--COAL REFUSE DISPOSAL CONTROL ACT.
For primary bibliographic entry see Field 6E.
W74-06195

THE SEARCH FOR TOMORROW'S POWER,
K. F. Weaver.
National Geographic, Vol 142, p 650-681, November 1972. 4 charts, 16 photo.

Descriptors: *Nuclear energy, *Tidal energy, *Nuclear physics, *Radioactivity, Energy budget, Nuclear engineering, Energy transfer, Physics, Thermal radiation, Heat transfer, Flooding, Thermal pollution, Conduction, Hydrogen, Tritium, Heavy water, Deuterium.
Identifiers: Energy crisis.

The energy shortage is complicated by the problem of pollution. Electric power plants seem inevitably to discharge waste heat into the waterways. The National Environmental Policy Act (NEPA) requiring the study of the impact of power plants on the environment has added to industry miscalculations of energy needs. Strip-mining for coal, another potential energy source, has caused landslides, floods, and despoilation of the environment. Nuclear reactors present the most immediate solution, but give off large amounts of waste heat. Fusion reactors, not likely to be developed before the turn of the century, will end man's energy problems. Fusion will take energy from water. Fusion would reduce problems of pollution and radioactive wastes far below the levels of even the breeder reactor. Many different ideas have been developed to obtain energy until fusion reactors are perfected. In Britain one power plant uses the tides to produce energy and creates 240,000 kilowatts. Geothermal power is another potential source of energy and it is estimated California could use this to supply all of its energy needs. (Sperling-Florida)
W74-06198

DISCHARGE OF SEWAGE INTO WATERS.
For primary bibliographic entry see Field 6E.
W74-06199

KRESHTOOL V. DELMARVA POWER AND LIGHT CO. (PERMIT TO CONSTRUCT ELECTRIC GENERATING UNIT IN COASTAL ZONE)
For primary bibliographic entry see Field 6E.
W74-06201

WATER SUPPLY RESERVOIRS--RECREATIONAL ACTIVITIES.
For primary bibliographic entry see Field 6E.
W74-06202

SAVE OUR BAY, INC. V. HILLSBOROUGH COUNTY POLLUTION CONTROL COMMISSION (ACTION SEEKING TO PREVENT WATER POLLUTION).
For primary bibliographic entry see Field 6E.
W74-06203

CONSERVATION OF MARINE RESOURCES.
For primary bibliographic entry see Field 6E.
W74-06204

CONTAMINATION OF DRINKING WATER.
For primary bibliographic entry see Field 6E.
W74-06206

PROHIBITION OF WATER POLLUTION.
For primary bibliographic entry see Field 6E.
W74-06207

A BILL TO AMEND TITLE II OF THE WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 (PUBLIC LAW 92-500).
For primary bibliographic entry see Field 6E.
W74-06208

WATER ENVIRONMENTAL HEALTH ACT.
For primary bibliographic entry see Field 6E.
W74-06210

SOLID WASTE DISPOSAL.
For primary bibliographic entry see Field 6E.
W74-06211

GAGE V. COMMONWEALTH EDISON CO. (SUIT AGAINST AEC AND AN ELECTRIC COMPANY FOR ALLEGED DEPRIVATION OF RIGHTS UNDER NEPA).
For primary bibliographic entry see Field 6E.
W74-06212

A BILL TO AMEND THE FISH AND WILDLIFE COORDINATION ACT TO PROVIDE FOR THE PRESERVATION OF NATURAL GAME FISH STREAMS.
For primary bibliographic entry see Field 6E.
W74-06214

DRAINAGE, FLOOD AND POLLUTION CONTROL.
For primary bibliographic entry see Field 6E.
W74-06216

SUPERVISION OVER LOCAL SANITATION.
For primary bibliographic entry see Field 6E.
W74-06218

NAVIGATION--BOATING SAFETY AND REGULATIONS.
For primary bibliographic entry see Field 6E.
W74-06220

HARBORS AND RIVERS.
For primary bibliographic entry see Field 6E.
W74-06221

GAME AND FRESH WATER FISH.
For primary bibliographic entry see Field 6E.
W74-06222

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
For primary bibliographic entry see Field 6E.
W74-06223

WATER AND SEWER SYSTEM REGULATORY LAW.
For primary bibliographic entry see Field 6E.
W74-06224

PRIVATE SEWER SYSTEMS.
For primary bibliographic entry see Field 6E.
W74-06226

WATER POLLUTION CONTROL AND PUBLIC WATER SUPPLY.
For primary bibliographic entry see Field 6E.
W74-06227

WATER RESOURCES COMMISSION.
For primary bibliographic entry see Field 6E.
W74-06229

PROBLEMS IN WATER HYGIENE AND SANITARY PROTECTION OF WATER BODIES IN CONNECTION WITH URBANIZATION, (IN RUSSIAN),
Municipal Sanitary-Epidemiological Center, Pyatigorsk (USSR).
A. P. Bukhtoyarov.
Gig Sanit. Vol 37, No 2, p 86-88. 1972.
Identifiers: England, Europe, Japan, *Reviews, *Sanitary protection, *Urbanization, Wales, Water hygiene, *Public health, *Water quality standards, Water demand, Southwest U.S., Wisconsin, Minnesota.

Western literature on the problems of water pollution in capitalist countries was reviewed. Problems encountered at Lake Michigan, in the SW USA, Wisconsin, Minnesota, England and Wales, Canada, Japan and numerous European ccuntries are specifically mentioned. The problem of maintaining hygienic norms for water quality with increased demands of growing cities and industrial complexes is serious.--Copyright 1973, Biological Abstracts, Inc.
W74-06268

AIRTEX PRODUCTS, INC. V. POLLUTION CONTROL BOARD (AN APPEAL FROM AN AGENCY IMPOSED FINE FOR DISCHARGE OF CYANIDES INTO SEWER SYSTEM).
For primary bibliographic entry see Field 6E.
W74-06323

WATER QUALITY MAINTENANCE,
Eastern Associated Coal Corp., Pittsburgh, Pa.
T. E. Boettger, and T. A. Koza.
44 Penn. B.A.Q., p. 196-202, 1973. 39 ref.

Descriptors: *Pennsylvania, *Acid mine water, *Coal mines, *Coal mine wastes, *Mine drainage, Mine wastes, Water pollution, Industrial wastes, Mining, Mine water, Water pollution sources, Acidic water, Mine acids, Waste disposal, Strip mine wastes, Legislation.

The development of Pennsylvania law on the problem of acid mine wastes is surveyed. Legislative history indicated a preferential non-treatment of the coal mine drainage problem, along with a lack of technological expertise for removing the polluting properties of such drainage. The 1965 Amendments to the Clean Streams Law prohibited the subsequent discharge of mine drainage, and

required a mine operator to file an application for a permit approving its drainage plan before beginning mining operations. The 1970 Amendments to the Clean Stream Law prohibited mine discharges occurring after mining operations have ceased. A discussion is included of three recent cases under the amended Clean Streams Law. The first two cases held that a mine operator is not required to treat mine drainage which, in essence, is not from its own mining operation, but from adjacent, inactive mines. These cases are on appeal. The third case is pending, and will decide a mine operator's responsibility for acid water discharges after mining operations are abandoned. (Perrey-Florida)
W74-06330

ENVIRONMENTAL LAW--ZONING--ORDINANCE PROHIBITING FILLING WETLANDS ADJACENT TO NAVIGABLE WATERS WITHOUT PERMIT IS CONSTITUTIONAL EXERCISE OF POLICE POWER NOT REQUIRING PAYMENT OF COMPENSATION.
For primary bibliographic entry see Field 6E.
W74-06331

THE CITY OF FRESNO'S LEAKY ACRES GROUND-WATER RECHARGE PROJECT--CONSTRUCTION AND PERFORMANCE,
Agricultural Research Service, Fresno, Calif. Ground Water Recharge Field Station.
For primary bibliographic entry see Field 4B.
W74-06358

STUDY OF HYDROPHILIC MEMBRANES FOR OIL-WATER SEPARATION,
Gulf Environmental Systems Co., San Diego, Calif.
For primary bibliographic entry see Field 5D.
W74-06360

WATER QUALITY SIMULATION AND APPLICATION,
Environmental Research and Technology, Inc., Lexington, Mass.
For primary bibliographic entry see Field 5B.
W74-06419

A LITERATURE REVIEW OF TIMBER-HARVESTING EFFECTS ON STREAM TEMPERATURES: RESEARCH NEEDS FOR THE SOUTHWEST,
Forest Service (USDA), Tempe, Ariz. Forest Hydrology Lab.
For primary bibliographic entry see Field 4C.
W74-06437

ENVIRONMENTAL INFORMATION SYSTEMS DIRECTORY--AN INVENTORY OF ADMINISTRATIVE AND ENVIRONMENTAL MISSION SUPPORT SYSTEMS WITH INDEXES.
Environmental Protection Agency, Washington, D.C. Office of Planning and Management.
June 1973. 111p.

Descriptors: *Data storage and retrieval, *Information exchange, Systems analysis, Data transmission, Documentation, Abstracts, Information retrieval.
Identifiers: Data systems.

Automated and manual systems supporting the administrative and environmental-mission operations in the Environmental Protection Agency are described. For purposes of the Directory, systems have been defined as sets of manual or automated procedures used to collect, maintain, manipulate and use periodically information or data for a specific objective. Both existing systems and systems under development are included. The Directory consists of an Announcement Section, Subject Index, Organization Index, and System Manager Index. An announcement of each system consists of an identifying citation followed by an abstract or short description of the system. The citation identifies the system by title, location where operated, operational or developmental, year of implementation manual or automated, and the names and titles of System Manager and Data Processing Representative. The abstract describes the systems objectives, major information products and uses, and significant processing steps performed in the system cycle. For automated systems information includes. The number of applications programs, minimum computer memory requirements, and hardware on which the system is operated. (Knapp-USGS)
W74-06441

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

STUDIES IN THE ANALYSIS OF METROPOLITAN WATER RESOURCE SYSTEMS, VOLUME VIII: SOME DATA AND METHODS FOR ANALYZING METROPOLITAN WASTEWATER RECLAMATION AND REUSE SYSTEMS,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5D.
W74-05951

PUBLIC PARTICIPATION IN WATER POLLUTION CONTROL POLICY AND DECISION MAKING,
North Carolina State Univ., Raleigh. Dept. of Sociology and Anthropology.
A. C. Davis.
Available from the National Technical Information Service as PB-230 436, $3.75 in paper copy, $1.45 in microfiche. Water Resources Research Institute at the University of North Carolina, Raleigh, Report UNC-WRRI 74-88, December 1973, 47 p, 26 tab, 4 ref, 3 append. OWRR A-049-NC (3) 14-31-0001-3233.

Descriptors: *Decision making, Planning, Methodology, *North Carolina, Political aspects, *Water pollution control, *Water policy, *Attitudes, State governments, *Social participation, Social aspects.
Identifiers: Public participation, Public hearings.

A study is described of public awareness and concern about stream pollution, and more particularly, about a series of public hearings on stream classification held by the North Carolina Board of Water and Air Resources. Telephone surveys of a random sample of households in the areas affected found (1) a generalized awareness of stream pollution, (2) a concern about its importance, (3) a tendency to see stream pollution as a major topic of state concern, (4) a limited knowledge about state agencies, and (5) little knowledge of the public hearings despite the efforts of the agency. Few respondents attended the public hearings. Analysis of attendance at the hearings tended to show a relatively low level of public participation. Representatives of organized activities whose activities were immediately affected were present. Where suggested changes were perceived as threats to immediate interests, affected individuals also voiced opposition. Some indications of the lack of knowledge on the part of the general citizenry about the means of efficient participation were also noted. (McJunkin-North Carolina)
W74-05953

RIVERINE RECREATIONAL DEVELOPMENT--MATHEMATICAL MODELING,
Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-05958

APPLICABILITY OF PROGRAMMING MODELS TO PRICING AND RISK CONTROL IN WATER RESOURCE MANAGEMENT,
Pittsburgh Univ., Pa. Graduate School of Business.
R. F. Byrne, and M. H. Spiro.
Available from the National Technical Information Service as PB-230 616; $5.50 in paper copy, $1.45 in microfiche. Completion Report, August 1973. 165 p. OWRR A-028-PA(1). 14-31-0001-3838.

Descriptors: *Management, Pollutants, Effluent streams, Water allocation, Model studies, Water utilization, *Reviews, *Bibliographies, *Pollution taxes(Charges), Computer models, *Tax rates, Prices, Cost allocation, Cost analysis.
Identifiers: Pollution levels, *Programming models.

The applicability of programming models to problems in water resource management was evaluated. A comprehensive literature survey was made, and an annotated bibliography was prepared. A variety of Simple two-and three-user models were examined. The most interesting model formulation appeared to be one minimizing the costs of supplying the needs of these users subject to constraints on supply and on the levels of various pollutants. The behavior of the solutions to the models was examined utilizing hypothetical cost data. In particular, the shadow prices (or opportunity costs) to the various users were examined in relationship to costs. This exploration led to certain conclusions on the limitations of a tax system on water usage or effluent streams as a device for controlling pollution levels. These conclusions indicate that, under conditions believed to be rather common in water management, taxation cannot assure optimal resource allocation. The investigations indicated that programming models can be of value in examining some of the broader issues in water resource management.
W74-06104

SEQUENTIAL DETERMINISTIC OPTIMIZATION IN RESERVOIR OPERATION,
Iowa Univ., Iowa City Inst. of Hydraulic Research.
For primary bibliographic entry see Field 4A.
W74-06416

WATER QUALITY SIMULATION AND APPLICATION,
Environmental Research and Technology, Inc., Lexington, Mass.
For primary bibliographic entry see Field 5B.
W74-06419

THE HYDROLOGICAL EVALUATION OF REGIONAL WATER-RESOURCE SYSTEMS IN THE UNITED KINGDOM,
Water Resources Board, Reading (England).
For primary bibliographic entry see Field 6B.
W74-06421

THE OPTIMUM DEVELOPMENT OF WATER RESOURCES IN A RURAL SETTING,
North Dakota State Univ., Fargo.
For primary bibliographic entry see Field 4A.
W74-06422

AN APPROACH TO EVALUATION IN MULTIPLE OBJECTIVE RIVER BASIN PLANNING, AN ANALYSIS OF SELECTED WATER QUANTITY ALTERNATIVES IN THE OKANAGAN VALLEY, BRITISH COLUMBIA, CANADA,
Department of the Environment, Vancouver (British Columbia). Water Management Service.
J. O'Riordan.
In: Proceedings (Vol III), The International Symposium on the Planning of Water Resources, Mexico City, December 4-8, 1972. 48 p, 5 fig, 4 tab, 7 ref.

Descriptors: Water resources, Management, *River basin development, *Comprehensive planning, *Alternative planning, *Evaluation, Water quantity, Methodology, Water users, Simulation analysis, Decision making, Optimum development plans, Cost-benefit analysis, Mathematical models, Systems analysis, *Canada, *Multiple-purpose projects.
Identifiers: *Okanagan River Valley(British Columbia), Multiple objectives, Economic development, Environmental quality, Social well-being.

Canada and British Columbia signed an Agreement to develop a comprehensive framework plan for water resources management in the Okanagan Valley. The Agreement explicitly recognizes the multiple goals of economic growth and social betterment, indicating that it is based on the concept of multiple objective planning and that a more comprehensive approach to evaluation of alternative plans than the traditional cost-benefit analysis is required. Explored are the implications of a new, comprehensive river basin planning strategy on the evaluation process, and an empirical approach for establishing an evaluation matrix to compare alternative plans is described. The planning process associated with the Okanagan Basin Study is discussed, and the multiple goals are examined. Identified are the major consumptive and non-consumptive uses in terms of water quantity management, associated planning objectives are specified for present and future conditions, and each of the principal steps in the evaluation process is examined. Described is a simulation model of the mainstem system closely representing the observed pattern of inflow, developed to standardize the evaluation process. The process purpose is to determine the degree to which alternatives achieve planning objectives for specified user areas. Development of an evaluation matrix involves 3 steps-impact analysis; comparison with zero alternative; and weighting schemes--and should provide decision-makers with an information system enabling them to make a clear choice. (Bell-Cornell)
W74-06425

6B. Evaluation Process

INDIANA 1950-1970: LIFE TABLES FOR THE 14 ECONOMIC REGIONS AND ANALYSIS WITH MEASURES OF MEDICAL CARE,
Purdue Univ., Lafayette, Ind.
E. R. Cooper.
Available from National Technical Information Service as PB-230 488, $12.50 in paper copy; $1.45 in microfiche. M. Sc thesis 1972, 172p, 44 tab, 26 ref, 3 append. OWRR-C-3277-(3713) (2).

Descriptors: *Human population, *Rural areas, *Urban areas, Cities, Population, *Indiana, Longevity, Age, Mortality.
Identifiers: Life tables, *Life expectancy, Demography, Infant mortality, Urban population, Physicians, Hospital beds, Hospital patients, *Medical care.

Life tables were constructed for the 14 economic regions of Indiana in census years 1950 through 1970. Dependent variables were the following life table functions: infant mortality, expectation of life at birth, and expectation of life at age 65. Independent variables were urban population and the measures of medical care; physicians, hospital beds, patients admitted, patient days, occupancy rate for hospitals, and usage rate for hospitals. In 1950 there were urban-rural differences. However, it is significant that mortality is lower and expectation of life higher in the more rural economic regions. There were no urban-rural differences in 1960 or 1970, yet the variation in mortality and expectation of life among the economic regions increases. There is greater variation among the regions in 1970 than in 1950. Among the economic regions the larger the quantities of the four medical care variables the higher is mortality and the lower is expectation of life.
W74-05952

INSTITUTIONAL OPTIONS FOR RECYCLING URBAN SLUDGES AND EFFLUENTS ON LAND,
Metropolitan Sanitary District of Greater Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-05985

PUBLIC ACCEPTANCE--EDUCATIONAL AND INFORMATIONAL NEEDS,
Purdue Univ., West Lafayette, Ind.
For primary bibliographic entry see Field 5D.
W74-05986

A PLANNING CONCEPT FOR THE GEORGIA COASTAL ZONE.
Georgia Univ., Athens. Special Task Force Committee.
For primary bibliographic entry see Field 2L.
W74-05998

AN ANALYTICAL INTERDISCIPLINARY EVALUATION OF THE UTILIZATION OF THE WATER RESOURCES OF THE RIO GRANDE IN NEW MEXICO: SOCORRO REGION,
New Mexico State Univ., University Park. Dept. of Agricultural Economics.
R. R. Lansford, S. Ben-David, T. G. Gebhard, Jr., W. Brutsaert, and B. J. Creel.
Available from the National Technical Information Service as PB-230 615; $4.50 in paper copy, $1.45 in microfiche. New Mexico Water Resources Research Institute, Las Cruces. Partial Technical Completion Report No. 023, 1974. 95 p, 15 fig, 37 tab, 70 ref. OWRR A-045-NMEX(4).

Descriptors: *New Mexico, *Water utilization, *Water demand, Economics, *Water resources development, Management, *Economic predictions, *Surface-groundwater relationships, Natural resources, Water requirements, Resource allocation, River basins, Groundwater management, Water law, Interstate compacts, International compacts, Treaties, Litigation, Water quality, Water utilization, Human population, Employment, Industrial water, Recreation.
Identifiers: *Rio Grande Basin, *Socio-economic models, Groundwater appropriation, Input-output coefficients, Conjunctive use models, Economic land classification, Groundwater models, Irrigation water diversions, *Socorro Region(N.Mex).

An interdisciplinary approach to the solution of the water resource problems of the Socorro Region in New Mexico was centered around a socioeconomic model, developed to represent the New Mexico economy, with special emphasis placed upon the Rio Grande region. Inputs into the socio-economic model were obtained from separate studies. Three sets of alternatives were considered: (1) Without a water constraint, in the Rio Grande region, both production and depletions are expected to exhibit the largest increase (59.7 percent and 47.4 percent, respectively); (2) When a surface-water constraint is imposed, the value of production is reduced by $18.1 million in 2020 and water depletions are expected to decrease about 18.1 percent by 2020; (3) When a total water constraint is imposed, the value of production is decreased $4.1 million below that expected when using only a surface-water constraint, and water depletions are reduced about 8.4 percent. The Socorro Region is expected to follow the general trend of the total Rio Grande region but at a lower growth rate. The expected increase in total value of production from 1970 to 2020 is 46.8 percent, employment about 21 percent. When a surface-water constraint is imposed, production is expected to be reduced $0.6 million in 2020, employment by 49 employees, and water depletions by 8,918 acre-feet. When an additional constraint is imposed on ground water in the Socorro Region, production would be decreased $1.0 million in 2020, employment by an additional 107 employees, and water depletions by 533 acre-feet. (Hain-New Mexico)
W74-06103

MULTIPLE PLANNING FOR MULTIPURPOSE WATER RESOURCE SYSTEMS: A STRUCTURE FOR REGIONAL WATER RESOURCE DEVELOPMENT,
INTASA, Menlo Park, Calif.
D. P. Lijesen, A. P. Delarue, J. Rosing, L. T. Brekka, and J. L. Poage.
Available from the National Technical Information Service as PB-230 619; $6.00 in paper copy, $1.45 in microfiche. Completion Report, November 1973. 213 p, 38 fig, 33 tab, 61 ref. OWRR C-4264(9042)(1).

Descriptors: *Planning, Land use, Comparative costs, *Multiple purpose projector, *Cost sharing, Benefits, Recreation, *Water supply, *Reservoir design, *Regional analysis, *Management, Recreation demand, Flood control, *Alternative planning, Systems, Assessments, Evaluation, Economics, Social aspects, Environmental effects, Research priorities.

Six key phases are identified for the integrated process of planning and evaluation of multiple purpose, multiobjective water resource systems: Need identification, formulation of alternative systems, assessment of impacts, evaluation, display and implementation. Within the process, three major problem areas which contribute significantly to the complexity of the process are identified, analyzed and illuminated through the use of carefully selected case studies. These problem areas: interdependencies between planning objectives and the implications for project planning and evaluation; interdependencies between purposes and the implications for project design and planning; financial interdependencies and implications of cost sharing rules on multilevel decision making as related to the implementation phase. The case studies currently in the planning stage are used to demonstrate three practical planning tools: comparative analysis of alternative land use plans used to delineate economic and social impacts of different land uses and analyze their implications for water resource planning; tradeoff analysis used to assess the importance of benefit tradeoffs between flood control and urban recreation; senitivity analysis used to determine necessary changes in the design and operation of a system designed primarily for water supply in order to better accomodate other purposes. Finally, a stepwise procedure for planners is given, together with an outline of priority research areas. (Davenport-INTASA)
W74-06106

TOMORROW'S ENVIRONMENTAL BENEFIT-COST ANALYSIS,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 6G.
W74-06115

A FRAMEWORK FOR LOCAL PARTICIPATION AND DECISION-MAKING,
Oregon State Univ., Corvallis. Cooperative Extension Service.
For primary bibliographic entry see Field 6G.
W74-06116

WATER ZONING: THE MANAGEMENT OF SURFACE ACTIVITY ON LAKES, STREAMS, RIVERS AND BAYS,
Michigan Univ., Ann Arbor. Shorelands Management Unit.
P. C. Ryner.

Available from the National Technical Information Service as COM 73-11078; for $3.00 in paper copy, $1.45 in microfiche. Michigan University Sea Grant Program Publication MICHU-SG-73-101 (SMG-1), March 1973. 15 p.

Descriptors: *Michigan, *Recreation demand, Swimming, Fishing, Lake Michigan, *Zoning, Water sports, Boating, Social impact, Regulation, Water policy, *Water management(Applied).
Identifiers: Water zoning.

Many lakes and rivers of Michigan are reaching a point at which some form of regulation and control might be considered. Wherever people enjoy water activities, crowded conditions are now a frequent and perhaps all too familiar situation. This situation is not confined to the summer months; increasingly, it is also a winter problem, as numerous vehicles, some of them capable of reaching high speeds, take advantage of the considerable ice fields found throughout the state. One way of eliminating conflicts is to designate specific areas or zones for individual activities. If enjoyable recreation is to continue, density regulations may be necessary for most water and shore areas. The concept of water zoning can deal with only some of the complex issues facing both the Great Lakes and the inland waters of the state of Michigan. (Knapp-USGS)
W74-06377

RIVER BASIN PLANNING AND THE FOREST INDUSTRY--COMPROMISE OR CONFLICT,
Saint John River Basin Board (New Brunswick).
J. M. Henderson, and R. B. B. Dickison.
Pulp and Paper Magazine of Canada, Vol 74, No 11, p 32-34, Nov 1973. 1 map.

Descriptors: *River basin development, *Pulp and paper industry, *Canada, *Maine, Water resources development, *Water management(Applied), River Basin Commissions, Biochemical oxygen demand, Water pollution sources, Pollution abatement, Pulp wastes, Optimization, *Planning.
Identifiers: *Saint John River Basin, New Brunswick, Forest products industry.

In the St. John River Basin area, the pulp and paper industry contributes 25% of all jobs, but also 75-80% of all man-made BOD in the stream. Model studies indicate that even a 90% reduction of BOD may overload the river at low flow. A plan for managing this important water resource of East Canada and Maine has been developed by the St. John River Basin Board. It aims at optimizing the balance of present and future water user demands with the available supply. The Board is comprised of three Federal and three Provincial (New Brunswick) government representatives and aided by an Advisory and Liaison Committee. It solicits the paper industry's cooperation in multiple-use planning of land, especially forested lands, without endangering the industry's competitiveness in foreign markets. (Brown-IPC)
W74-06398

ALTERNATIVE WATER RESOURCE SYSTEMS IN THE LOWER MEKONG,
Economic Commission for Asia and the Far East (UN), Bangkok (Thailand). Mekong Committee Secretariat.
For primary bibliographic entry see Field 4A.
W74-06418

THE HYDROLOGICAL EVALUATION OF REGIONAL WATER-RESOURCE SYSTEMS IN THE UNITED KINGDOM,
Water Resources Board, Reading (England).
D. G. Jamieson, and J. R. Sexton.
In: Proceedings (Vol III), The International Symposium on the Planning of Water Resources, Mexico City, December 4-8, 1972. 23 p, 7 fig, 1 tab, 2 ref.

Descriptors: Water resources development, Hydrology, *Design, *Simulation analysis, *Reservoirs, Reliability, *Evaluation, Operating costs, Methodology, Pumped storage, Rivers, Estuaries, Mathematical models, Systems analysis, Economics, *Regional analysis.
Identifiers: River Great Ouse(England), *United Kingdom.

A method referred to as two-phase simulation is proposed for the hydrological design of complex water resource systems. Water projects based on the integrated use of systems comprising reservoirs, aquifers, rivers, and aqueducts are being planned in England and Wales. At the design stage, a limited number of alternative patterns of development must be evaluated in considerably more detail than is possible at the planning stage. The scale of the problem and the complexity of such analysis necessitate the use of simulation. In two-phase simulation, the first stage is simulation of the river flows, and the second phase is simulation of the proposed reservoir system. The river-flow simulator derived in the first phase is embedded in the secondary phase and the resulting simulation of the complete water resource system is run for a long period of record. Performance of the complete system in terms of reliability of meeting the forecast water requirements and operating costs is summarized in a form convenient for input to the economic evaluation. This method is being used for the hydrological design of the Wash Storage, a pumped-storage reservoir scheme in the estuary of the River Great Ouse in southeast England. (Bell-Cornell)
W74-06421

THE IMPACT OF CHANGING COST AND QUALITY OF INDUSTRIAL WATER ON TECHNICAL CHANGE AND PLANT LOCATION DECISIONS,
National Bureau of Economic Research, New York.
For primary bibliographic entry see Field 3E.
W74-06424

AN APPROACH TO EVALUATION IN MULTIPLE OBJECTIVE RIVER BASIN PLANNING, AN ANALYSIS OF SELECTED WATER QUANTITY ALTERNATIVES IN THE OKANAGAN VALLEY, BRITISH COLUMBIA, CANADA,
Department of the Environment, Vancouver (British Columbia). Water Management Service.
For primary bibliographic entry see Field 6A.
W74-06425

PROBLEMS AND IMPLICATIONS IN THE DEVELOPMENT OF ARID LANDS,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
D. H. K. Amiran.
In: Coastal Deserts, their natural and human environments, ed. by D.H.K. Amiran and A.W. Wilson. University of Arizona Press, 1973. p 25-32, 2 tab, 11 ref.

Descriptors: *Arid lands, *Arid climates, *Land development, *Deserts, Land reclamation, Semiarid climates, Dry seasons, Land use, Land management, Management, Planning, Project planning, Future planning(Projected), Decision making, Regional development, Water resources management.

Because of their dissimilarities, world arid zones present different developmental problems, to which increasing attention is directed because of population pressures and a decreasing supply of commodities. Because non-indigenous immigrants into the arid zones bring with them environmental concepts more related to the humid areas from which they came, some developments are self-defeating. Basic to arid zone development, then, is an understanding of the limited resources and a full recognition of the consequences of environmental engineering. Priorities must be established, long-term planning undertaken, and educational programs in support of decisions that may be uncomfortable, are necessary components of proper development of the world's arid zones. (Muller-Arizona)
W74-06465

THE CHANGING ROLE OF WATER IN ARID LANDS,
Colorado Univ., Boulder. Inst. of Behavioral Science.
G. F. White.
In: Coastal Deserts, their natural and human environments, ed. by D.H.K. Amiran, and A.W. Wilson, University of Arizona Press, Tucson, 1973. p 37-43.

Descriptors: *Arid lands, *Semiarid climates, *Water demand, Water resources development, Deserts, Desalination, Demineralization, Impaired water quality, Saline water, Water supply, Water sources, Land development, Urbanization, Community development, Water utilization, Agriculture.

As the demand for the utilization of less and less hospitable land is increased by increasing population, the population of the land changes. Development of such lands, usually arid, starts from the natural state, through various phases of agriculture to urbanization. Agricultural demand on an arid system increases as production is expanded. This is usually accompanied by an increase in population, and corresponding establishment of small urban and recreational demands on the region. Further urbanization causes competition between urban and agricultural users. This is illustrated in the dry southwestern United States where initially agrarian communities have grown and industrialized. In such situations the demand for water from all competing uses exceeds available supply, necessitating the establishment of priorities. Unless these priorities are made with a consideration for the attitude of the public toward water, the resulting development can be expected to offer meager returns. The need for water budgeting, for fair pricing of water and for a re-examination of water programs is emphasized. It is concluded that developments in modern technology such as saline water conversion or development of salt tolerant crops, are not sufficient to make arid areas productive without alterations in the perception of water by the inhabitants of these regions. (Muller-Arizona)
W74-06466

DESALTED SEAWATER FOR AGRICULTURE: IT IS ECONOMICAL,
Resources for the Future, Washington, D.C.
For primary bibliographic entry see Field 3A.
W74-06467

PLASTIC OASES FOR ARID SEASHORES,
Arizona Univ., Tucson. Environmental Research Lab.
For primary bibliographic entry see Field 3A.
W74-06468

ON THE CAUSES OF ARIDITY ALONG A SELECTED GROUP OF COASTS,
Wisconsin Univ., Milwaukee. Dept. of Geography.
For primary bibliographic entry see Field 2B.
W74-06469

ON THE ORIGIN OF THE DRY CLIMATE IN NORTHERN SOUTH AMERICA AND THE SOUTHERN CARIBBEAN,
Oregon State Univ., Corvallis. Dept. of Geography.
For primary bibliographic entry see Field 2B.
W74-06470

NEW EVIDENCE ON THE CLIMATIC CONTROLS ALONG THE PERUVIAN COASTS,
Wisconsin Univ., Milwaukee. Dept. of Geography.
F. J. Prohaska.
In: Coastal Deserts, their natural and human environments, ed. by D. H. K. Amiran and A. W. Wilson, University of Arizona Press, Tucson, 1973, p 91-107. 9 fig, 4 tab, 32 ref.

Descriptors: *Coasts, *Arid climates, *Climatic data, Arid lands, Atmospheric pressure, Climatic zones, Meteorology, Droughts, Orography, Precipitation(Atmospheric), Temperature, Topography, Weather data, Winds, South America.
Identifiers: *Peru, *Atmospheric inversions, Trade winds.

Wind patterns cannot account for the equi-latitudinal distribution of the coastal deserts of the world. These should actually be considered as being equidistant from the equitorial trough or low, rather than from the equator. For this reason the dry areas of Peru may be considered anomalous on the global setting. The winds of the region are found to be predominantly parallel to the coastline. Temperature inversions are also noted, caused by subsidence-induced adiabatic heating from above and cooling from below. These inversions are the key to climate of the area. They occur in two distinct patterns. A detailed description is presented of the characteristics of the inversions, the associated atmospheric humidity, cloud cover, precipitation and temperature for both the trade wind inversions of the winter (May 16 through September 30) and of the summer (January 1 through May 15) for the study year 1967. The sudden transition from the two inversionary types is noted. The particularly abrupt transition from summer to winter conditions on May 16,1967 is documented. These rapid changes are attributed to the correspondingly rapid changes in the trade wind pattern. A short discussion of the El Nino anomalous phenomenon is also included. (Muller-Arizona)
W74-06471

DISTINCTIVE HYDROGEOLOGICAL CHARACTERISTICS OF SOME PAMPAS OF THE PERUVIAN COASTAL REGION,
Sao Paulo Univ. (Brazil). Dept. of Geology.
For primary bibliographic entry see Field 4B.
W74-06472

THE COASTAL DESERT OF CHILE,
For primary bibliographic entry see Field 2B.
W74-06473

CLIMATIC PROFILE OF THE NORTH CHILE-AN DESERT AT LATITUDE 20 DEGREES SOUTH,
Saskatchewan Univ., Regina. Dept. of Grography.
For primary bibliographic entry see Field 2B.
W74-06475

NEW DIRECTIONS IN THE CHILEAN NORTH,
Colorado Univ., Boulder. Dept. of Geography.
For primary bibliographic entry see Field 3B.
W74-06476

THE FISH-MEAL INDUSTRY OF IQUIQUE,
Universidad Catolica de Valparaiso (Chile). Departamento de Geografia.
For primary bibliographic entry see Field 3F.
W74-06477

THE PLIO-QUATERNARY CLIMATIC CHANGES ALONG THE SEMIARID SEABOARD OF CHILE,
Tunis Univ. (Tunisia). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W74-06478

COASTAL DESERTS OF THE OLD WORLD AND THEIR RECLAMATION,
Akademiya Nauk SSSR, Leningrad. Botanicheskii Institut.
For primary bibliographic entry see Field 4A.
W74-06479

CLIMATIC-GEOMORPHOLOGICAL ZONES AND LAND UTILIZATION IN THE COASTAL DESERTS OF THE NORTH SAHARA,
Stuttgart Univ. (West Germany). Geographisches Institut.
For primary bibliographic entry see Field 4A.
W74-06480

THE CRISIS OF THE SAHARAN OASES,
Paris Univ. (France). Dept. of Geography.
J. Despois.
In: Coastal Deserts, their natural and human environments, ed. by D. H. K. Amiran and A. W. Wilson. University of Arizona Press, Tucson, 1973, p 167-169. 14 ref.

Descriptors: *Deserts, *Economic impact, *Social impact, Industrial production, Water resources, Income distribution, Agriculture, Population, Aquifers, Artesian wells.
Identifiers: *Sahara Desert, *Oases.

The impact of industrial developments in the Sahara on the traditional life, culture, and agriculture of its oases is analyzed. Advances in oil, gas, and iron ore production since the mid nineteen fifties, plus the implementation of better transport have revolutionized the social structure without adequate preparation for the drastic changes involved. The traditional subsistence economy has been disturbed by a money economy, emphasizing endemic social inequities. A fluctuating population characterized by a dangerous increase further aggravates the situation, while the return of a substantial number of those originally attracted away from oasis life has failed to provide the support required to improve agriculture or livestock. Problems appear to center around how to save the traditional economy of the oases, how to integrate it into the modern economy, and how to aid farmers and livestock owners so that they benefit from the new economy and technology instead of being victimized by such developments. In the southern Sahara especially, where the number of artesian wells has increased and where a rich aquifer of deep water has been discovered, crop production could be increased, with a ready-made market in new mining centers. Some mechanism is needed to make a return to an improved agriculture attractive to a new generation lured away. A plea is made for a return to oasis life, enhanced by modern technology that will create educational, employment, and social benefits. Otherwise, the outlook, not only for oases inhabitants but for those urbanites dependent on the former products of oases, is a gloomy one. (Paylore-Arizona)
W74-06481

EILAT: SEASIDE TOWNS IN THE DESERT OF ISRAEL,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
D. H. K. Amiran.
In: Coastal Deserts, their natural and human environment, ed. by D. H. K. Amirand and A. W. Wilson. University of Arizona Press, Tucson, 1973, p 171-175. 3 fig.

Descriptors: *Coasts, *Decision making, *Planning, *Urbanization, Deserts, Water supply, Desalination plants, Regional economics, Water resources development, Land management, Mining, Natural resources, Fishing, Arid climates, Arid lands, Climate, Tourism.
Identifiers: *Israel(Eilat).

Eilat, located at the southern end of the rift valley of the Dead Sea, is the southernmost community of Israel and its only Red Sea port. The foundation of the town in biblical times was probably due to the availability of groundwater. It has an arid desert climate characterized by high summer temperatures and low precipitation. Employment is based on either the development of natural resources or service to the town of Eilat itself. When available groundwater, both locally pumped and transported, was exceeded by water demands, a dual-purpose desalination and electrical generating plant was established, and currently an experimental crystalization type desalination plant is being developed. Eilat's three natural assets, mineral resources, fishery, and desert climate, offer the best opportunities for economic development, with only limitations stemming from the remoteness of Eilat from the centers of economic activity in Israel. An oil refinery is also proposed for the area but since construction would be severely detrimental to fishing and to the tourist industry, the choice in the establishment of the plant is critical to the future of Eilat. (Muller-Arizona)
W74-06482

THE UTILIZATION OF THE NAMIB DESERT, SOUTHWEST AFRICA,
California Univ., Los Angeles. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W74-06483

ECONOMIC DEVELOPMENT OF THE AUSTRALIAN COASTAL DESERTS,
Western Australia Univ., Nedlands.
J. Gentilli.
In: Coastal Deserts, their natural and human environments, ed. by D. H. K. Amiran and A. W. Wilson. University of Arizona Press, Tuscon, 1973, p 189-204. 6 fig, 2 tab, 43 ref.

Descriptors: *Australia, *Coasts, *Regional economics, *Meteorological data, *Weather patterns, Surveys, Transportation, Desalination, Fisheries, Mineral industry, Harbors, Water wells, Winds, Crops, Irrigation.

Five subregions of the northwestern littoral of the Australian continent are discussed, with a brief mention of the less extensive area, the southern littoral. Meteorological conditions as they affect the economic development of the area are described, with tables showing the rainfall patterns, agricultural activities, and transport data. Historical information includes development of various industries, especially mineral, fisheries, and vegetable crops; demographic information; and some generalized attention to a synoptic analysis of the region as a whole. Water losses in areas devoted to commercial agricultural production occur through action of persistent southerly winds of summer; irrigation practices to offset these losses are described. In the Shark Bay-Carnavon area the main source of income is irrigated agriculture dependent on pumped and shallow wells tapping groundwater, and from concrete-lined wells in the Gascoyne River bed. Also described is the desalination plant at Dampier using waste heat from a power station to produce potable water for a variety of needs. (Paylore-Arizona)
W74-06484

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ENGINEERING AND ECONOMICS OF SLUDGE HANDLING,
Bauer Engineering, Inc., Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-05981

ECONOMIC ASPECTS OF THE APPLICATION OF MUNICIPAL WASTES TO AGRICULTURAL LAND,
Illinois Univ., Urbana.
For primary bibliographic entry see Field 5D.
W74-05983

APPLICABILITY OF PROGRAMMING MODELS TO PRICING AND RISK CONTROL IN WATER RESOURCE MANAGEMENT,
Pittsburgh Univ., Pa. Graduate School of Business.
For primary bibliographic entry see Field 6A.
W74-06104

6D. Water Demand

WATER ZONING: THE MANAGEMENT OF SURFACE ACTIVITY ON LAKES, STREAMS, RIVERS AND BAYS,
Michigan Univ., Ann Arbor. Shorelands Management Unit.
For primary bibliographic entry see Field 6B.
W74-06377

THE IMPACT OF CHANGING COST AND QUALITY OF INDUSTRIAL WATER ON TECHNICAL CHANGE AND PLANT LOCATION DECISIONS,
National Bureau of Economic Research, New York.
For primary bibliographic entry see Field 3E.
W74-06424

THE CHANGING ROLE OF WATER IN ARID LANDS,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 6B.
W74-06466

6E. Water Law and Institutions

THE COLUMBIA INTERSTATE COMPACT: POLITICS OF WATER RESOURCES IN THE PACIFIC NORTHWEST,
Washington State Univ., Pullman. Dept. of Political Science.
H. R. Doerksen.
Available from the National Technical Information Service as PB-230 484, $17.75 in paper copy, $1.45 in microfiche. PhD thesis, 1974. 276 p, 2 fig, 35 tab, 108 ref, 3 append. OWRR A-055-WASH (2), 14-31-0001-3848.

Descriptors: Administrative agencies, *Columbia River, *Pacific Northwest, Washington, Water resources development, *Interstate compacts, *Regional development, Political aspects, Institutional constraints, *Political constraints.
Identifiers: *Columbia Interstate Compact.

The Columbia Interstate Compact represented an attempt to establish a regional institutional mechanism for river basin development. After seven Pacific Northwest states spent 18 years negotiating the Compact, and five attempts were made to ratify the Compact in the state legislatures, Oregon and Washington had not ratified. This study is a history of the Compact negotiations, describing the efforts of the seven states in the context of the political environment in which the Compact was negotiated. Several factors which contributed to the ultimate dissolution of the negotiating effort are analyzed in some depth. First, role perciptions (sense of negotiating objectives) of Compact commissioners varied substantially from state to state and within states in a period of time when attitudes related to river basin development were typically strong and polarized. Second, the negotiating environment changed in such a way as to reduce the preceived need for a Compact. Finally, financial crisis, after Washington, and Oregon discontinued financial support of the effort, forced the Compact Commission to close its office. The most devastating defeat of the Compact attempt came in the Washington Legislature. There the Compact became embroiled in the existing conflict regarding power generation and marketing. Although the Compact effort may be dead, most issues with which it dealt, including allocation of water, reservation of power for states in which a dam is constructed, and out-of-basin diversion, are very much alive.
W74-05957

FEDERAL AND STATE LEGISLATIVE HISTORY AND PROVISIONS FOR LAND TREATMENT OF MUNICIPAL WASTEWATER EFFLUENTS AND SLUDGES,
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
R. H. Sullivan.
In: Recycling Municipal Sludges and Effluents on Land; Proc of Joint Conference, July 9-13, 1973, Champaign, Illinois: National Association of State Universities and Land-Grant Colleges, Washington, D.C. p 1-7, 1973. 2 tab.

Descriptors: *Waste disposal, *Waste water disposal, Water law, *Sludge disposal, *Recycling, *Legislation, Federal government, Regulation, State governments, Landfills, Public health, Research and development, Water pollution control, *Water reuse.
Identifiers: Land disposal(Wastes).

Both Federal and State legislation and regulations related to land treatment are in a state of development. The current situation and the range of actions possible under present rules are discussed. The results of research and development, demonstration projects, and working installations will help to determine future legislation and regulations. The Federal government has traditionally left the jurisdiction of this activity in the province of State and local governments, as essentially a public health matter. However, the large amount of Federal grant funds that have been made available, concern about the total environment, and Federal laws and regulations on land, water, and air quality have combined to make the Federal government active in financing and evaluating effective land treatment of municipal effluents and sludges. State and local governmental units have also shown increasing interest in land treatment of effluents and sludges, both as a desirable method of wastewater treatment under appropriate conditions and as a public health matter which needs guidance and regulation. (See also W74-05963) (Knapp-USGS)
W74-05964

A REGIONAL VIEW ON THE USE OF LAND FOR DISPOSAL OF MUNICIPAL SEWAGE AND SLUDGE,
Environmental Protection Agency, Chicago, Ill. Region V.
For primary bibliographic entry see Field 5D.
W74-05969

MORGAN CITY PUBLIC HEARING TESTIMONY.
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
November 9, 1972. 18 p.

Descriptors: *Water resources development, *Coasts, *Coastal marshes, *Water conservation, *Water supply, *Louisiana, Area redevelopment, Project planning, Water resources, Water demand, Wildlife conservation, Recreation, Water rights, Competing uses, Water policy, Natural resources, Environmental effects.

The Mayor of Morgan City outlined various needs which he hoped the Louisiana Advisory Commission on Coastal and Marine Resources would investigate. He felt the coastal areas needed greater highway accessibility, and more deep water channels open to the Gulf if they are to maintain an economically competitive position. He felt the natural resources should be preserved to the fullest extent possible, especially mentioning a sufficient fresh water supply as well as maintaining the Atchafalaya Basin for recreation and commercial fisheries. The State Land Office felt the primary concern should be to legalize and control encroachment on state-owned waters. The Wild Life and Fisheries Commission felt the greatest need was for preserving the wetlands in their natural state, as they provide a source of livelihood for many citizens and contribute greatly to the state's economy, and also for the recreational benefits they provide. The main concern of a marine surveyors organization was the great need for an adequate fresh water supply. (Sutton-Florida)
W74-05997

THE CONTINENTAL SHELF LANDS OF THE UNITED STATES: MINERAL RESOURCES AND THE LAWS AFFECTING THEIR DEVELOPMENT, EXPLOITATION, AND INVESTMENT POTENTIAL,
North Carolina Univ., Chapel Hill. School of Public Health.
E. Dahle, Jr.
Available from National Technical Information Service, Springfield, Va, 22151, as COM-73-11340, $3.75 in paper copy, $1.45 in microfiche. University of North Carolina Sea Grant Publication UNC-SG-73-11, June 1973. 80 p, 397 ref. NOAA SG04-3-158-40.

Descriptors: *Law of the sea, *Legislation, *Continental Shelf, *Marine geology, *Investment, *Mineralogy, Oceanography, Sea water, International waters, Oil industry, Economics, Mineral industry, Exploration, Water resources, Legal aspects, Oceans, International law, Federal government, State governments.

An overview is presented of the United States' Continental Shelf legislation with special emphasis placed on the development and exploitation of the Shelf's mineral resources. Legal factors influencing investment in ocean industries are evaluated. Part I of this study provides a working knowledge of the Shelf's physical characteristics and its present delimitation. Part II presents an overview of the mineral resources known to exist in such areas including oil, hard rock minerals and minerals concentrated in marine organisms, to increase awareness of both the current and potential value of the U.S. shelves. The third part of the study analyzes private investment from both the corporate and individual standpoint, and an effort is made to expose both the benefits and drawbacks inherent in such investment. Part IV analyzes nationwide legislation affecting the development and exploitation of these mineral resources, with separate treatment of federal and state legislation. In Part V current legal developments at the international level are brought into perspective, including organizations whose purpose is to coordinate marine activities and pollution control. (Sutton-Florida)
W74-06000

LOUISIANA WETLANDS PROSPECTUS.
Louisiana Advisory Commission on Coastal and Marine Resources, Baton Rouge.
For primary bibliographic entry see Field 2L.
W74-06003

CIBOLO PROJECT, TEXAS.
Hearing--Subcomm on Water and Power Resources, Comm on Interior and Insular Affairs, U.S. House of Representatives, 93d Cong, 1st Sess, June 22, 1973. 70 p.

Descriptors: *Texas, *Legislation, *Water supply, *Government financing, *Groundwaters, Water allocation(Policy), Planning, Dams, Reservoirs, Water demand, Water requirements, Water resources development, Fish management, Wildlife management, Recreation, Flood control, Water loss, Evaporation, Structures, Feasibility studies, Cost allocation, Environmental engineering, Water distribution, Industries, Municipalities, Water utilization.
Identifiers: *Cibolo project(Tex).

These hearings were held in San Antonio, Texas, for the purpose of obtaining a firsthand report from the people of Texas on their feelings regarding the Cibolo project. A feasibility study of the Cibolo project was begun in 1964 in an effort to devise a comprehensive program to manage the combined surface and ground water resources in the San Antonio area. The project will consist of Cibolo Dam and Reservoir, purchase of adjacent lands for recreation, construction of recreational facilities, and accomplishment of recommended fish and wildlife management measures. The estimated cost of the project is in excess of forty million dollars. The project would provide substantial municipal and industrial water supply, flood control, recreation and fish and wildlife benefits. Statements were entered into the record by Congressmen, state legislators, mayors of nearby municipalities, and various other public officials, One witness noted that the economic development of the area would be greatly enhanced through the availability of a surface supply to augment existing sources. A Sierra Club representative, however, denounced the project as a stop-gap measure to patch up the water supply of an already overpopulated area. (Ritchie-Florida)
W74-06004

PROPOSED BIG CYPRESS RESERVE, FLORIDA.
Hearings--Before the Subcommittee On National Parks And Recreation of the Committee On Interior and Insular Affairs, U.S. House of Representatives, 93d Cong., 1st Sess., May 10, 11, 1973. 209 p, 3 fig, 3 map, 3 tab.

Descriptors: *Federal government, *Florida, *National parks, *Watershed management, *Budgeting, Decision making, Public lands, Watershed protection, Water conservation, Project planning, Water policy, Recreation demand, Recreation facilities, Surface run-off, Subsurface water, Ground water recharge.
Identifiers: *Congressional hearings.

Among witnesses were the governor of Florida, Congressional representatives, concerned landowners, conservation associations, and corporate officials. Between $150 million and $175 million is needed for the Big Cypress Reserve in Florida, and several representatives state their fears that the project will not be funded even though it is already authorized because the President's budget does not include any funds for federal recreation land acquisitions. The Big Cypress area is critical as a part of the watershed nourishing the northwestern portion of the Everglades National Park, providing more than half the surface flow water for the Everglades National Park. The Big Cypress also recharges ground water, which is the principal domestic water source in central Florida and it also is one of the last refuges for a number of endangered species. Additionally, it can support an increasing number of people seeking recreation. (Sperling-Florida)
W74-06005

A SUMMARY-DIGEST OF STATE WATER LAWS.
National Water Commission, Arlington, Va.
Available from Superintendant of Documents, U.S. Government Printing Office, Wash., D.C., for $4.55. Order no. Y3.N21/2L44/2. 1973. R. L. Dewsnut, D. W. Jensen and P. W. Swenson, editors.

Descriptors: *Legislation, *Water law, *Judicial decisions, *Governments, *State governments, Administrative agencies, Legal aspects, Regulation, Riparian rights, Water utilization, Water rights, Navigable waters, Boundaries(Property), Institutions, Management.

A summary-digest is presented of the water laws of the 50 states, their statutes, court decisions, and administrative arrangements. Special emphasis is put on the acquisition, use, transfer, and management of water rights. The volume consists of a general survey of state water law doctrines and institutions including development, nature, organizational structure, and special subjects. It also contains fifty chapters, with each chapter devoted to the laws of one of the fifty states, and, each chapter is subdivided into development, organization, surface waters, and ground waters. At the end of each chapter a list of related publications is included. (Conko-Florida)
W74-06006

WATER RESOURCES DEVELOPMENT--1973.
Hearing--Before the Subcommittee on Water Resources of the Committee on Public Works, U.S. House of Representatives, 93d Cong., 1st Sess., May, June 1973. 1443 p.

Descriptors: *Federal government, *Project planning, *Water conservation, *Water resources, Legislation, Political aspects, Water supply, Flooding, Flood protection, Water injury, Harbors, Flood damage, Recreation, Electric power plant, Decision making.
Identifiers: *Congressional hearings.

Testimony was taken from the Association of Port Authorities, interested environmental groups, Congressmen, and the Army Corps of Engineers. The first day of hearings concerned proposed rivers and harbors and flood control projects of the U.S. Army Corps of Engineers. The value of these projects was recently shown in Mississippi where in its worst flood in two hundred years over $400 million in damages occurred, and in excess of ten million acres was inundated. Without the project, damages would have exceeded $6 billion and twenty-seven million acres would have been flooded. Last year's flood control bill was vetoed by the President, but similar identical legislation has been reintroduced. This committee is responsible for providing for flood control, navigation, water supply, power, recreation, and conservation of the nation's water resources. (Sperling-Florida)
W74-06007

PUBLIC WORKS FOR WATER AND POWER DEVELOPMENT AND ATOMIC ENERGY COMMISSION APPROPRIATION BILL, 1974 PART 3.
Hearings--Subcomm of the Committee on Appropriations--House of Representatives, 93d Cong., 1st Sess., March 21, 1973. 1231 p.

Descriptors: *Southeast U.S., *Hydroelectric power, *Federal government, *Administrative agencies, *Federal budgets, Federal Power Act, Federal Reclamation Law, Legislation, Hydroelectric plants, Water resources development, Government finance, Political aspects.
Identifiers: Congressional hearings.

The Department of the Interior's budgetary requests for the fiscal year 1974 were the subject of these hearings. Officials of the various projects administered by the Department testified in support of their respective budgetary requests. The major part of the testimony dealt with Department projects involving the production of hydroelectric power in different parts of the country. Included therein was the Southeastern Power Administration. Testimony was also presented in support of the appropriation sought for the Water Resources Council. Numerous charts and maps were included showing the costs of the various projects conducted by the Department as well as the benefits to be derived from them. Most of the projects concerned in the hearings were ongoing projects of the Department of the Interior. (Flowers-Florida)
W74-06008

OFFSHORE MARINE ENVIRONMENT PROTECTION ACT OF 1973, FIRST SESSION ON S.80.
Hearings--Comm. on Commerce--United States Senate, 93d Cong, 1st Sess, March 5, 6, and 12, 1973. 335 p, 22 fig, 7 map, 10 illus, 21 photo, 10 tab.

Descriptors: *Environmental protection, *Coastal structures, Waterways, Construction, Coastal waters, Environmental effects, Navigation, Safety, Legislation, United States, Coastal engineering, Shore protection, Shores, Coasts.
Identifiers: Congressional hearings, Coastal zone management.

This is the first of three hearings on the subject of offshore artificial structures and the need for their regulation and control. The bill's purpose is to coordinate the full evaluation of potential impact on the marine environment of the construction of large-scale offshore artificial structures. Safety of navigation is an additional concern. The bill will amend the Ports and Waterways Safety Act of 1972 which provided for authority to be placed in the National Oceanic and Atmospheric Administration for the certification of the environmental soundness of the site selection, construction and operation of offshore artificial structures for port and terminal, powerplant, airport, and other such facilities to be located in the coastal waters. (Daniels-Florida)
W74-06009

PROTECTING AMERICA'S ESTUARIES: FLORIDA.
For primary bibliographic entry see Field 5G.
W74-06010

AN ANALYTICAL INTERDISCIPLINARY EVALUATION OF THE UTILIZATION OF THE WATER RESOURCES OF THE RIO GRANDE IN NEW MEXICO: SOCORRO REGION,
New Mexico State Univ., University Park. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W74-06103

HOW EFFECTIVE ARE ENVIRONMENTAL IMPACT STATEMENTS.
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 6G.
W74-06107

WHAT IS AN ENVIRONMENTAL IMPACT STATEMENT,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6G.
W74-06108

CEQ - A VIEW FROM THE TOP,
Council on Environmental Quality, Washington, D.C.
For primary bibliographic entry see Field 6G.
W74-06109

EPA REVIEW OF THE EIS,
Environmental Protection Agency, Seattle, Wash.
For primary bibliographic entry see Field 6G.
W74-06110

THE BUREAU OF RECLAMATION AND RESOURCE DEVELOPMENT,
Bureau of Reclamation, Boise, Idaho.
For primary bibliographic entry see Field 6G.
W74-06112

ENVIRONMENTAL POLICIES OF THE CORPS OF ENGINEERS,
Corps of Engineers, Portland, Oreg. North Pacific Div.
For primary bibliographic entry see Field 6G.
W74-06113

A BILL TO CREATE AN UPPER MISSISSIPPI RIVER RECREATIONAL AREA.
House Bill 11603, 93d Cong, 1st Sess (1973). 15 p.

Descriptors: *Legislation, *Recreation, *Mississippi River, *Project planning, Illinois, Iowa, Minnesota, Missouri, Wisconsin, Interagency cooperation, Conservation, Land management, Land use, Natural resources, Recreation facilities, Government finance, Penalties(Legal), Environment, Preservation, Fish, Wildlife, Comprehensive planning.

In order to conserve and protect in their natural state certain areas of land and water in and along the Upper Mississippi River, and to develop such areas for recreational use of the public, there is authorized the Upper Mississippi River National Recreation Area. The area shall include the Mississippi River and portions of the first tier of counties along the river in the states of Illinois, Iowa, Minnesota, Missouri and Wisconsin, and shall comprise no more than 650,000 acres of land and water. The Secretary of the Interior shall establish the area by publication of notice at such time as he determines that sufficient lands, waters or interests therein are in public ownership and provide an efficiently administrable unit. The Secretary is also authorized to acquire those lands, waters and interests therein proposed for acquisition by the master plan. There is also established an Upper Mississippi River National Recreation Area Council, to be composed of thirteen members, who shall assist the Secretary in developing a master plan for the project. (Ritchie-Florida)
W74-06175

A BILL TO AMEND THE FISH AND WILDLIFE COORDINATION ACT, AND FOR OTHER PURPOSES.
House Bill 10651, 93d Cong, 1st Sess (1973). 8 p.

Descriptors: *Legislation, *Fish, *Wildlife, *Wildlife habitats, *Wildlife conservation, Interagency cooperation, Wildlife management, Streams, Bodies of water, Legal aspects, Government finance, Impounded water, Channelization, Permits, Regulation, Environmental effects.

Whenever the waters of any stream or other body of water are proposed to be impounded, diverted, widened, deepened or otherwise modified by any federal agency, such agency shall first ascertain the probable effect of the project on wildlife. This shall be done by consulting with the United States Fish and Wildlife Service, the National Oceanic and Atmospheric Administration, and the state agency which has administrative authority concerning the affected wildlife resources, as well as obtaining a report from the Secretary of the Interior and the Secretary of Commerce. This report shall include the effects attributable to the project on wildlife resources and the measures that should be adopted to prevent damage to wildlife resources and provide for enhancement of such resources. Any citizen may commence a civil action on his own behalf against any person, including the United States, who is alleged to be in violation of any provision of this Act or any regulation established pursuant to this Act. (Ritchie-Florida)
W74-06176

A BILL TO AMEND THE ACT OF AUGUST 3, 1968, RELATING TO THE NATION'S ESTUARIES AND THEIR NATURAL RESOURCES, TO ESTABLISH A NATIONAL POLICY WITH RESPECT TO THE NATION'S BEACH RESOURCES.
House Bill 10394, 93d Cong, 1st Sess (1973). 8 p.

Descriptors: *Legislation, *Legal aspects, *Beaches, *Public rights, *Public access, Coasts, Oceans, Recreation, Vegetation, Natural resources, Riparian land, Riparian rights, Estuaries, Government financing, Construction, Structures, Eminent domain, Transportation, Land use, Land management, Land development, Federal government.
Identifiers: *Injunctive relief.

This bill, amending 16 U.S.C. 1221 et. seq., relating to the Nation's estuaries and their natural resources, is to establish a national policy with respect to the Nation's beach resources. 'Beach' is defined as the area along the shore of the sea affected by wave action directly from the open sea. It is more precisely defined as, in the case of typically sandy or shell beach with a discernible vegetation line, it is that area which lies seaward from the line of vegetation to the sea, or in the case of a beach having no discernible vegetation line, the beach shall include all area formed by wave action not to exceed two hundred feet in width. The public shall have free and unrestricted right to use the beaches as a common, consistent with constitutionally protected property rights of littoral landowners. No person shall erect or maintain any obstruction which interferes with the unrestricted right of the public to enter or use as a common the public beaches. An action shall be cognizable to establish and protect the public right to beaches, determine the existing status of title, and condemn such easements as are necessary to effect the purposes of this title. The Secretary of the Interior is authorized to make grants to the states to carry out this title. (Ritchie-Florida)
W74-06177

A BILL TO AMEND THE PROJECT FOR FLOOD PROTECTION ON INDIAN BEND WASH, MARICOPA COUNTY, ARIZONA, AUTHORIZED BY THE FLOOD CONTROL ACT OF 1965.
House Bill 10135, 93d Cong, 1st Sess (1973). 1 p.

Descriptors: *Legislation, *Government financing, *Arizona, *Canals, *Siphons, Irrigation, Construction, Structures, Flood protection, Flood control, Project purpose.
Identifiers: Flood Control Act of 1965, Arizona Canal.

The project for flood protection on Indian Bend Wash in Maricopa County, Arizona which was authorized by the Flood Control Act of 1965, is modified to provide that the siphon system from the Arizona Canal, required to be provided in connection with the relocation of irrigation facilities, shall be furnished at full federal expense. (Ritchie-Florida)
W74-06178

A BILL TO EXPAND THE NATIONAL FLOOD INSURANCE PROGRAM BY SUBSTANTIALLY INCREASING LIMITS OF COVERAGE AND TOTAL AMOUNT OF INSURANCE AUTHORIZED TO BE OUTSTANDING AND BY REQUIRING KNOWN FLOOD PRONE COMMUNITIES TO PARTICI PATE IN THE PROGRAM AND FOR OTHER PURPOSES.
House Bill 8449, 93d Cong, 1st Sess (1973). 15 p.

Descriptors: *Legislation, *Floods, *Flood plains, *Flood plain insurance, *Flood plain zoning, Flood damage, Non-structural alternatives, Government finance, Legal aspects, Regulation, Land use, Flood protection, Construction, Mud flows, Land management, Soil conservation, Groundwater recharge, Surface-groundwater relationships, Federal government.

Annual losses throughout the nation from floods and mudslides are increasing as a result of the accelerating development of, and concentration of population in, areas of flood and mudslide hazards. It is in the national interest, therefore, to preserve, protect, develop and restore the flood capacity and resources of the nation's flood plain areas and to maintain the natural environment of such areas. The purpose of this act is to substantially increase the limits of coverage authorized under the national flood insurance program, provide for the identification of flood-prone areas, encourage the establishment of conservation areas, and encourage the formulation of flood-plain ordinances. No federal agency shall approve financial assistance for acquisition or construction in any area identified as having special flood hazards unless the project is covered by flood insurance in an amount at least equal to its development or project cost. In addition, no federal agency shall approve financial assistance for use in any area identified as having special flood hazards unless the community in which such area is located is participating in the national flood insurance program. (Ritchie-Florida)
W74-06179

CONCURRENT RESOLUTION CONCERNING THE ADMINISTRATION OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972.
House Concurrent Resolution 290, 93d Cong, 1st Sess (1973). 2 p.

Descriptors: *Legislation, *Government finance, *Federal Water Pollution Control Act(FWPCA), Water pollution, Water pollution control, Water pollution treatment, Treatment facilities, Construction, Costs, Legal aspects, Water supply, Environment, Environmental effects, Cost repayment, Water quality, Water quality control, Administrative agencies, Water demand, Potable water, Water purification.
Identifiers: Environmental Protection Agency(EPA).

The Administrator of the Environmental Protection Agency should not administer section 206 of the Federal Water Pollution Control Act (FWPCA) so as to establish any system of priorities which provides for the reimbursement of construction costs of water pollution control facilities built after June 30, 1966, prior to reimbursement of construction costs of such facilities built between June 30, 1956 and June 30, 1966. The resolution notes the deterioration in the condition of this nation's water systems, and the possibility of being without a decent water supply. Prior to the public awareness over the quality of the environment, a number of state and local governments acted with foresight to forestall disaster befalling the nation's water systems, and the FWPCA authorized reimbursement to those state and local governments which had the foresight to construct water pollution control facilities years ago. (Ritchie-Florida)
W74-06180

OPPEN V. AETNA INSURANCE CO. (ACTION FOR DAMAGES TO PLEASURE BOATS RESULTING FROM OIL SPILL DISASTER).
485 F.2d 252-260 (9th Cir. 1973).

Descriptors: *Judicial decisions, *Third party effects, *Environmental effects, *Harbors, *Federal-state water rights conflicts, *California, Federal jurisdiction, State jurisdiction, Legal aspects, Admiralty, Oily water, Boats, Water pollution, Water law, Civil law, Oil pollution, Navigation, Navigable waters, Pollutants, Pollution sources.

Owners of private pleasure boats sought to recover for physical damages to their boats caused

by an oil spill disaster, as well as damages for loss of navigation rights. On preliminary questions, the court held that a resolution on the choice of law issue with respect to whether admiralty jurisdiction and maritime law apply to a tort controversy must be based on the locale of the tort, the nature of defendants' activities, and also as to whether the wrong bears a significant relationship to traditional maritime activity. Plaintiffs were awarded compensation for the physical damages to their boats; however, damages were denied as to the second claim. The court reasoned both state and federal law applied. Under federal maritime law, the loss of the use of a private boat is not compensable. Further, for recovery under California law, as plaintiffs based their claims on a public nuisance theory, their damages had to have been different in kind from that suffered by the public generally. Since no special damages were shown, recovery was denied under state law. The court distinguished cases allowing damages from loss of navigation rights, stating in each of those, the chattel itself was unavailable for use because of the physical damage thereto or wrongful detention thereof and as their boats were usable, no damages were allowed. (Sutton-Florida)
W74-06181

WATER POWER.
N.Y. Environmental Conservation Law, secs. 15-1701 through 15-1751, p. 504-536 (1972).

Descriptors: *New York, *Legislation, *Water law, *Hydroelectric power, *Hydroelectric project, Permits, Regulation, Dams, Reservoirs, Canals, Water policy, Rivers, Streams, Watersheds, Legal aspects, Licensing, Impoundments, State governments, Administrative agencies, Structures, Impounded waters, Development, Water utilization, Water management, Riparian rights, Navigable waters, Land use, Planning.

Where any person takes, diverts, appropriates or otherwise uses the waters of the state of New York, over which the state has proprietary ownership of the flow and the use, such waters shall remain subject to the power and control of the state for purposes of regulation, licensing, controlling and termination of their use by such persons. The right to develop water power is contingent upon obtaining a license to do so from the Department of Environmental Conservation. Once permission is obtained, the licensee remains subject to the property rights of others, including riparian rights, when constructing, operating and maintaining across or along any such lands and waters dams, reservoirs, diverting canals, water conduits, power houses, transmission lines and other project works. Before issuing said licenses the Department shall determine that the exercise of such privileges will not impair or interfere with navigation upon such waters, and shall impose such conditions upon the licensee to protect and safeguard navigation. No license shall be vested unless and until signed and sealed by the governor. (Silber-Florida)
W74-06182

REGIONAL WATER PLANNING AND DEVELOPMENT.
N.Y. Environmental Conservation Law, secs. 15-1101 thru 15-1113 (1972).

Descriptors: *New York, *Legislation, *Water policy, *Water management(Applied), *Water resources, Project planning, Water law, Water resources development, Water supply, Water storage, Water utilization, Conservation, Regional development, Regions, Cities, Water demand, Water distribution, Water permits.

This title was enacted in order to stimulate and encourage local participation and assistance in the comprehensive planning for the protection, control, conservation, development and beneficial utilization of the water resources of New York. Any municipality may submit a petition requesting a survey and study of the water resources of a specified region of which the petitioning municipality is a part, for the purpose of preparing and providing a comprehensive plan for the protection, conservation, development and beneficial use of such resources. Upon receipt of a petition, the department shall hold public hearings for the purpose of hearing all persons, public corporations and state agencies in favor of or opposed to the proposals. If the department shall determine that the proposal should be undertaken, it shall appoint a regional planning board. Plans submitted after approval shall show the available and feasible sites for the installation of protective and regulatory works, and the benefits estimated to be derived from such installation. The plans shall also estimate the minimum annual amount of water available and shall provide for the storage of sufficient water for distribution. Any municipality may request that a plan be rescinded or modified. (Ritchie-Florida)
W74-06183

POWERS AND DUTIES OF DEPARTMENT OF FISH AND WILDLIFE.
N.Y. Environmental Conservation Law, secs. 11-0305 thru 11-0325 (1972).

Descriptors: *New York, *Legislation, *Fish, *Wildlife, Permits, Shellfish, Regulation, Legal aspects, Fish management, Fish conservation, Fish populations, Diseases, Waters, Water resources, Water resources development, Fish hatcheries, Water levels, Environmental effects, Droughts, Water supply, Water quality control, Water management, Water development.

Additional powers and duties are granted to the New York department of fish and wildlife. These include the power to regulate the taking of fish, increase the mesh of nets, regulate the transportation, importation and exportation of shellfish and management of all hatching and biological stations, game farms and game refuges owned or operated by the state. The department shall have power to close any waters of the state to the taking of fish whenever an environmental investigation reveals that fish life is in imminent danger of undue depletion because of low water levels brought on by drought. After consultation with the appropriate agencies of neighboring states, the department shall have power to fix open seasons, minimum size limits, manner of taking and seasonal limits for the taking of fish in the waters of New York. The department shall compile and index each year after the adjournment of the legislature the laws relating to fish and wildlife as amended. When it is determined by the appropriate state agencies that a disease which endangers fish, wildlife, livestock or humans exists in any area of the state, the department shall have authority to suspend or prohibit all hunting, trapping or fishing in and adjacent to the infected area. (Ritchie-Florida)
W74-06184

RESTRICTIONS ON STRUCTURES BUILT OVER STATE WATERS.
N. H. Rev. Stat. Ann., ch. 488-B:1 to 488-B:2 (Supp. 1972).

Descriptors: *New Hampshire, *Water resources development, *Structures, *Structural design, *Legislation, *Water conservation, Water resources, Legal aspects, Penalties(Legal), Shores, Regulation, Land use, Riparian land.

No new construction or modification of an existing structure intended for use as a dwelling shall be permitted if any part extends beyond the shoreline of any public or publicly owned body of water. In this regard, 'shoreline' shall be that shoreline which exists when the surface of the water is at the mean high water level. Any person who violates the statute shall be fined not more than one thousand dollars and shall be required to remove the structure or portion thereof in violation of the statute. Such fine shall accrue to the use of the town or city in which the structure is located. (Sutton-Florida)
W74-06185

LAND AND WATER CONSERVATION AND RECLAMATION.
Pa. Stat. Ann., secs. 5101-5121, p. 52-63 (1967).

Descriptors: *Pennsylvania, *Legislation, *Water law, *Conservation, *Land reclamation, Planning, Land development, Water quality, Water pollution control, Water pollution sources, Waste disposal, Waste treatment, Mine wastes, Mine drainage, Mine water, State governments, Administrative agencies, Water resources development, Streams, Waste water disposal, Waste water treatment, Cities, Water management.

The Land and Water Conservation and Reclamation Act encompasses the prevention, control and elimination of stream pollution from mine drainage, the prevention, control and elimination of air pollution from burning coal refuse banks, and the restoration of abandoned mines, as well as the construction, reconstruction and improvement of sewage treatment plants and facilities, to accelerate the restoration and protect the quality of the state's waters. Plans for abatement of stream pollution by constructing and operating interceptor plants and other facilities appurtenant to polluters and dischargers are also outlined. Reclamation of used and abused lands as well as creation and establishment of recreation facilities and park space is provided for. The Act provides for state financial subsidies to the various municipalities and subdivisions that participate in the amount of one hundred million dollars. (Silber-Florida)
W74-06186

OIL TERMINAL FACILITIES.
N.C. Gen. Stat., secs 143-215.95 thru 143-215.99 (1973).

Descriptors: *Oil pollution, *Legislation, *Enforcement, *North Carolina, Water law, Oil wastes, Air pollution standards, Water pollution standards, Wildlife pollution standards, Research, Education, Natural resources, Water resources development, Data acquisition, Data processing, Pollution control, Regulation, Water policy, Environmental engineering, Navigation, Structures.
Identifiers: *Oil terminal facilities, *Oil refining, *Secretary of Natural and Economic Resources.

The North Carolina Secretary of Natural and Economic Resources shall administer the provisions for oil terminal facility registration and engage in research concerning oil terminal facilities. Mandatory registration need be obtained with respect to all terminal facilities by furnishing the requisite information to the office of the Secretary of Natural and Economic Resources. Further legislation concerning oil pollution shall be recommended, and all rules and regulations necessary for the implementation of legislation may be adopted. Penalties exist for violations of any rule or regulation. Also included is a provision providing for the construction of facilities for oil refining based upon air, water, and wildlife pollution standards. (Proctor-Florida)
W74-06187

HELMS V. DIAMOND (APPEAL FROM AGENCY ORDER PROHIBITING LANDING OF SEAPLANES ON BODIES OF WATER WITHIN FOREST PRESERVE).
349 N.Y.S. 2d. 917 (Sup. Ct. 1973).

Descriptors: *New York, *Judicial decisions, *Legal aspects, *Water law, *Water rights, Prescriptive rights, Ground water, Competing

uses, State governments, Administrative agencies, Water utilization, Water resources, Water management, Water resources development, Natural resources, Surface waters, Water policy, Regulations, Standards, Adverse possession.
Identifiers: Injunctive relief.

This is an action in the State of New York by petitioner, engaged in the seaplane business, seeking a judgement nullifying and enjoining an order by respondent, Commissioner of Environmental Conservation prohibiting the landing of seaplanes on bodies of water wholly bounded by State land within the Adirondack Park. The Supreme Court of Schenectady County held that the petitioner failed to establish that the order was beyond the power of the Commissioner or that it was arbitrary and capricious and therefore a preliminary injunction would be denied. The Court noted that injunctions are sparingly issued and a clear legal right thereto plus a showing of irreparable injury must be present before such relief may be granted. Furthermore, the Court rejected petitioner's claim of adverse possession and stated that it is impossible for individuals to acquire vested rights in a state forest preserve by means of adverse possession, long use or prescriptive right. (Silber-Florida)
W74-06188

FLOODWAY REGULATIONS.
N.C. Gen. Stat., secs. 143-215.56 (1971).

Descriptors: *North Carolina, *Permits, *Flood plain zoning, *Floodplains, *Flood protection, Floodproofing, Flood damage, Public health, Regulation, State governments, Floodways, Zoning, Building codes, Water zoning, Legislation, Adoption of practices, Local governments, Administration, Coordination, Public safety, Legal aspects, Decision making.
Identifiers: *Administrative regulations.

This statute regulates artificial obstructions in floodways. The channel and a portion of the floodplain of all the state's streams will be designated as a floodway and artificial obstructions may not be placed there except in accordance with the statute. The purpose of this designation is to help control and minimize the extent of flood damage in flood hazard areas. The statute delineates uses which may be made of floodways as a matter or right, and provides that local governments can issue permits for the use of floodways if they are consistent with the purposes of the statute. The Board of Water and Air Resources and local governments may designate a floodway by showing it on a map or drawing, or by written description. If the Board determines an area to be a floodway and the local governments within which the stream lies have not delineated it as such, they will still bear the responsibility to control the uses in that area. Prior public notice and notice to local governments will be given to apprise all interested persons of the nature of the regulations, the effective date, and the stream affected thereby. (Sperling-Florida)
W74-06189

WELL CONSTRUCTION ACT.
N.C. Gen. Stat., secs. 87-83 through 87-96 (1967).

Descriptors: *North Carolina, *Adoption of practices, *Regulation, *Water conservation, *Water sources, Water table, Subsurface water, Watershed management, Well casings, Permits, Artesian wells, Legislation, Pumps, Confined water, Engineering structures, Water bearing formations, Artesian wells, State governments, Administration, Water pollution sources, Public health.
Identifiers: *Administrative regulations.

Improperly constructed, operated, maintained, or abandoned wells can adversely affect the public health and the ground water resources. This statute provides for the adoption of rules governing the location, construction, repair, and abandonment of wells, and the installation and repair of pumps and pumping equipment. Any proposed rules must go before public hearings. Prior permission must be obtained for the construction of any water well or well system with a designed capacity of one hundred thousand gallons or more. Anyone who completes or abandons any well is to furnish a certified record of the construction or abandonment within thirty days. Each well is to be maintained and constructed so as not to be a source or channel of contamination of the groundwater supply or any aquifer. Valves and casings are to be maintained on flowing artesian wells so the flow of water can be stopped. Each well is also required to have an access port to determine the water level. Whenever mineralized or polluted water zones are present they must be adequately cased or cemented. Water for domestic consumption will be sterilized. Rights of investigation, entry, access and inspection exist to insure compliance with the regulations. Provisions are also made to give notice of alleged violations and a hearing whose final order is subject to judicial review. (Sperling-Florida)
W74-06190

SOLID WASTE DISPOSAL.
N C Gen Stat, secs. 130-166.16 thru 130-166.33 (1969).

Descriptors: *Solid waste disposal, *Sewage treatment, *Groundwater, Pollution, *North Carolina, *Water quality control, Water law, Administrative agencies, State legislation, Public health, Public safety, Landfills, Ultimate disposal, Water pollution sources, Waste dumps, Water quality, Sewage, Sewage disposal, permits.

The North Carolina Department of Human Resources will maintain administrative units to promote sanitary disposal of solid waste in accordance with the promotion of the preservation of the environment. The Department is authorized to engage in research to implement a statewide solid waste disposal program. State standards of solid waste disposal shall be formulated and applied. The Department may accept loans and grants in order to aid research and implementation. Provisions for the recordation of the Department's order of approval for sanitary landfills are set forth. The Ground Absorption Sewage Disposal System Act of 1973, a portion of this act, manifests the effort to combat the detrimental effect of the contamination of ground water supply created by the faulty installation of ground absorption sewage disposal systems. Local health departments shall issue improvement authorizations for installation work. Upon satisfactory completion, certificates of completion shall issue. A limitation upon electrical service is established until inspection is completed. Procedures for appeals to the local board of health upon denial of permits and judicial review are provided. (Proctor-Florida)
W74-06191

DEPARTMENT OF SEA AND SHORE FISHERIES: COMMISSIONER.
6 Me Rev Stat Ann, tit. 12, secs 3451, 3452, 2501-3505 (Supp 1972-1973).

Descriptors: *Maine, *Marine fisheries, *Estuarine fisheries, *Legislation, *Conservation, Coastal waters, Shellfish, Estuarine environment, Environment, Fish management, Fisheries.

The Department of Sea and Shore Fisheries is renamed the Department of Marine Resources. The department is established to conserve and develop marine and estuarine resources and to conduct and sponsor research; to promote and develop the Maine coastal fisheries industry; to advise agencies of state and local government and agencies of the Federal Government concerned with development or activity in coastal waters; to implement, administer and enforce the laws and regulations enacted under the direction of a Commissioner of Marine Resources. The commissioner may authorize the taking of polluted shellfish for the purpose of depurating them. The powers and duties of the commissioner include making a biennial report, holding property, accepting funds and entering into reciprocal agreements. Other subjects within the realm of the activities of the commissioner include conservation and development of marine resources, conservation of certain marine species, and procedure for adoption of regulations. (Sears-Florida)
W74-06192

RESEARCH AND DEVELOPMENT.
6 Me Rev Stat Ann, Tit. 12, secs 3701-3708 (Supp 72-73).

Descriptors: *Maine, *Research and development, Cultivation, Conservation, Coasts, Marshes, Wetlands, Shores, Legislation.
Identifiers: *Coastal waters, *Coastal zone management.

This statute covers acquisition of flats and waters, experimentation and cultivation in areas closed because of contamination, research by private interests, special licenses, interference or unlawful taking, marine resources research and the authorization of the Commissioners of Sea and Shore Fisheries and Inland Fisheries and Game to manage and lease certain alewife fishing rights. Any coastal waters or any coastal flats may be set apart for scientific research or experimental cultivation of marine species. Experimentation on shellfish and other marine species on shores, waters and flats closed because of contamination is authorized. Any private party interested in research in shellfish or development of the shellfish industry or seaweeds must make application to do so. A special license can be granted exempting the holder from certain laws relating to the taking of fish or shellfish. It is unlawful for any person to destroy any marine species or interfere with the shores in any area set apart as above stated. (Sears-Florida)
W74-06193

PROTECTION AND IMPROVEMENT OF WATERS: GREAT PONDS PROGRAM.
16 Me Rev Stat Ann, tit 38, secs 380-285 (Supp 1973).

Descriptors: *Maine, *Ponds, *Legal aspects, *Legislation, Eutrophication, Bodies of water, Aquatic habitats, Surface waters, Standing waters, *Water pollution control.

Great ponds are valuable. Uses are causing rapid acceleration of the eutrophication of great ponds. There are a number of entities within the state of Maine administering programs related to great ponds, these programs need coordination. Existing water related environmental statutes were basically developed for free-flowing bodies of waters and are not adequate for application in protecting great ponds. It is the intention of the legislature that existing programs related to great ponds continue in their present form and that the Department of Environmental Protection develop new programs. A great pond is any inland body of water which in its natural state has a surface area in excess of 10 acres, and any inland body of water artifically formed or increased which has a surface area in excess of 30 acres, the shore of which is owned by 2 or more persons. The board shall establish criteria for classifying great ponds and guidelines for waste control systems, maintain a data bank and conduct research. (Sears-Florida)
W74-06194

NATURAL RESOURCES--COAL REFUSE DISPOSAL CONTROL ACT.
W Va Code Ann, secs 20-6C-1 through 20-6C-8 (1972).

Descriptors: *West Virginia, *Legislation, *Water utilization, *Water sheds, *Land management, Water policy, Watershed protection, Flood control, Impoundment, Impounded waters, Industrial use, coal mine wastes, Industrial wastes, Strip mine wastes, Water control, Coals, Waste disposal.
Identifiers: Coal refuse disposal piles, Injunctive relief.

West Virginia statute known as the Coal Refuse Disposal Control Act recognizes that in certain areas disposition of materials displaced in the mining of coal creates coal refuse disposal piles which have in the past and may in the future endanger the lives and properties of persons residing in the hallows and valleys of the affected watersheds. These piles may also threaten streams, roads, schools and other public properties and facilities, and result in the creation of emergency situations. The act authorizes the director of the department of natural resources to inspect all coal refuse disposal piles and associated water impoundments and make competent engineering evaluations and opinions concerning their adequacy and stability. Within a year the director shall make findings concerning the stability and safety of coal refuse disposal piles which may cause water impoundments or otherwise pose a hazard to human life. Whenever the director determines that a coal refuse disposal pile poses an imminent threat to human life he may enter the land involved without the landowner's permission and take whatever remedial action may be necessary or expedient to abate the dangerous conditions. (Silber-Florida)
W74-06195

PENDING WATERSHED PROJECTS.
Hearings--Before the Subcommittee On Water Resources, Committee On Public Works, U S Senate, 93r Cong, 1st Sess, October 4, 1973. 17 p, 2 tab.

Descriptors: *Watersheds(Basins), *Watershed management, Governments, Floods, Flood control, Water, Water resources, Water utilization, Land, Land use, Land development, Structures, Levees, Irrigation, Drainage, Recreation, Fish, Wildlife, Water supply, Water management, Erosion, Kentucky, Texas, New Mexico, Pennsylvania, Illinois.

The Watershed Protection and Flood Prevention Act authorizes the Secretary of Agriculture to cooperate with local organizations having authority to carry out, maintain, and operate works of improvement for flood prevention or for the conservation, development, utilization and disposal of water and related land resources in watershed areas. The Act provides for a project-type approach to soil and water resource development, use, and conservation. Significant watershed problems include those requiring implementation of projects such as floodwater retarding structures, levees, floodways, irrigation, and drainage improvements; recreation or fish and wildlife development; municipal or industrial water supply systems; and other water management measures. An integral and extremely important part of watershed projects is the system of land treatment measures such as contouring, terracing, grass waterways and vegetative practices, to reduce erosion of upland areas and provide for conservation of all resources in the project area. Watershed work plans for the Banklick Creek Watershed, Kentucky, the Cornudas, North and Culp Draws Watershed, Texas and New Mexico, the Hitson, C and L, and Washburn Draws Watershed, Texas, the Nescopeck Creek Watershed, Pennsylvania, and the Upper Salt Creek Watershed, Illinois were considered. (Ritchie-Florida)
W74-06196

DISCHARGE OF SEWAGE INTO WATERS.
N Y Sees Laws, Ch 664, secs 17-1701 through 17-1741 (McKinney 1973).

Descriptors: *New York, *Sewage, *Water quality control, *Water pollution, *Impaired water quality, Industrial wastes, Liquid wastes, Solid wastes, Waste water(Pollution), Water pollution sources, Legislation, Governmental interrelations, State governments, Effluents, Permits, Water law.

No person, corporation or municipality shall place, or cause to be placed, or discharged into any of the waters of New York, in quantities injurious to the public health, any of the following: sewage, garbage, offal, any decomposable or putrescible matter of any kind, effluent from any sewage disposal plant, any substance, chemical or otherwise, any refuse or waste matter, either solid or liquid, from any sewer or drainage system or from any shop, factory, mill or industrial establishment; unless permission to do so shall have first been given in writing as provided in this article. It shall be unlawful for any person to introduce into any spring, brook or body of water used in the manufacture of salt, any impure or deleterious substance or thing whatsoever. Whenever the commissioner shall determine that sewage of any kind is being discharged into any of the waters of this state, and when in the opinion of the commissioner such discharge is polluting such waters in a matter injurious to health, he may order the municipality, corporation or person to show cause why such discharge should not be discontinued. After a hearing, the commissioner may issue an order directing that the discharge be discontinued. (McKnight-Florida)
W74-06199

RIVER IMPROVEMENT.
N Y Sess Laws, Ch 664, secs 15-2301 through 15-2321 (McKinney 1973).

Descriptors: *Channel flow, *River regulation, *Flood control, *Channel improvement, *Dikes, Legislation, Governmental interrelations, *New York, Navigable rivers, Public health, Regulation, Water management(Applied), Construction.
Identifiers: Administrative regulations.

Projects may be undertaken to improve channels, construct dikes or regulate river flow for the protection of life, property and the public health or welfare from damage by floods, to be done at the expense of both the owners of the properties and of the political subdivisions of New York benefited thereby. Bodies corporate known as river improvement districts may be created to carry out the purposes of this statute. Any county, city, town, or village, or any persons owning land bordering on or near any watercourse may petition for the formation of a district. After receipt of such a petition, the state shall investigate, conduct a public hearing, and then determine whether the public health, safety, or welfare require the formation of the district and make a final order with regard thereto. Within each district there shall be a River Improvement Association, the object of such association shall be to represent the interests of the district to the state. (McKnight-Florida)
W74-06200

KRESHTOOL V. DELMARVA POWER AND LIGHT CO. (PERMIT TO CONSTRUCT ELECTRIC GENERATING UNIT IN COASTAL ZONE)
310 A 2d 649 (Del Super 1973).

Descriptors: *Delaware, *Electric powerplants, *Permits, State governments, Administrative agencies, Industrial production, Regulation, Economic impact, Electric power industry, Water pollution, Community development, Water pollution effects, Psychological aspects, Administrative agency, Environmental effects, Judicial decisions, Legal aspects, Water law, Water pollution control, Coasts.
Identifiers: *Coastal Zone Act, *Environmental impact, Administrative regulations, Coastal Zone management, Administrative discretion.

This is an appeal from a final order of the State Coastal Zone Industrial Board which granted Delmarva Power and Light Company a permit to construct an electric generating unit. The new unit was to be located at a site where Delmarva presently operates four similar units. The appellants opposed Delmarva's application at the hearing, held by the Board which reviewed the state planner's decision. The Board affirmed the permit and an appeal was taken to the Supreme Court of Delaware. The Coastal Zone Act prohibits the construction of new heavy industry within the coastal zone. The purpose of the statute is to control the type of industrial development that is most likely to cause water pollution. To this end, the statute creates a permit issuing procedure and enumerates factors to be taken into consideration which include the environmental impact and aesthetic effects. The court held that the Board consider all the relevant factors set out in the statute, and that the court could not supplant the sound judgement of the Board with its own. (Sperling-Florida)
W74-06201

WATER SUPPLY RESERVOIRS--RECREATIONAL ACTIVITIES.
Pub Acts of Conn, act 73-522, secs 1,2,3,4. (1973)

Descriptors: *Connecticut, *Boating, *Sport fishing, *Water pollution sources, *Reservoir operation, Camping, Beaches, Public health, Recreation, Recreation wastes, Recreation facilities, Swimming, Treatment facilities, Reservoir management, Public health, Impounded waters, Water treatment, Water quality, Water quality control.

This act concerns recreational activities on the grounds of public water supply reservoirs. Sport fishing from definite shoreline locations and from oar propelled boats may be permitted by a water company. This permission will not issue until the commissioner of health and the department of environmental protection is consulted and it is found that treatment facilities are able to safeguard the health of persons drinking the water. The act also provides that all reservoirs constructed after 1974 must have such treatment facilities as will assure purity of the water supplies which such recreation is permitted. Water companies are empowered to issue permits and charge fees in order to reimburse the companies for the cost to them of such fishing and recreational activities. The act exempts water companies from liability, except for willful or wanton conduct, for injury or damage to any person entering its land under the provisions of this act. (Sperling-Florida)
W74-06202

SAVE OUR BAY, INC. V. HILLSBOROUGH COUNTY POLLUTION CONTROL COMMISSION (ACTION SEEKING TO PREVENT WATER POLLUTION).
285 So 2d 447-449 (Fla D C A 1973).

Descriptors: *Water pollution, *Abatement, *Judicial decisions, *Water quality control, Sewage treatment, *Florida, Water pollution effects, Aesthetics, Recreation, Water pollution sources, Water law, Water quality standards, Water treatment, Pollution abatement, Public safety, Public welfare, Recreation.
Identifiers: *Injunctive relief.

Appellants, members of a nonprofit corporation using the waters in controversy for bathing and recreation, appeal from the order of the trial court dismissing the amended complaint on the basis of appellants' lack of standing to sue. The court on appeal examined the question of whether the amended complaint states a cause of action. The appellants alleged in their complaint that they have for many years used the waters of Old Tampa Bay and its tributaries for bathing and recreation, and that the defendant utility companies have been continuously polluting in violation of Florida laws

and regulations by the discharge of improperly treated effluent into streams and tributaries. As a result, the Hillsborough County Pollution Control Commission (HCPCC) issued a pollution citation against the defendants who subsequently failed to upgrade their sewer plants or change pollution conditions. Appellants alleged that the HCPCC should have taken abatement action within thirty days of the receipt of the complaint. The District Court of Appeals ruled that the appellants possessed standing to sue and were not required to demonstrate injury beyond that sustained by the general public. The complaint was also held to be sufficient, and the lower court's decision was reversed. (Proctor-Florida)
W74-06203

CONSERVATION OF MARINE RESOURCES.
R I Gen Laws Ann, secs 46-17.1-1, 46-17.1-2 (Supp 1972).

Descriptors: *Rhode Island, *Legislation, *Water law, *Waste disposal, *Conservation, Fisheries, Water quality, Sewerage disposal, Natural resources, Aquatic life, Water management(Applied), Water utilization, Water rights, Legal aspects, Water quality control, Permits, Water pollution, Water pollution control, Navigation.

No person shall, without state permission, transport or cause to be transported, dump or cause to be dumped within the territorial waters of the state of Rhode Island, any waste or dredge material dredged from any harbor or channel or removed from any dump or sewerage treatment plant. These prohibited materials include mud, silt, shale, rock, muck, sand, garbage or sewerage. The director of the department of natural resources may issue permits for the transporting and disposal of dredge or waste materials within the territorial waters of the state. Issuance of the permit is conditioned upon written application, public hearing and an investigation by the director that such movement and disposal of materials as set forth in the application would not be in conflict with marine ecology, and that existing fishing grounds would not be damaged or destroyed. Upon issuance of a permit, a qualified state inspector, appointed by the director, must be on board the tow vessel for all transporting and dumping operations to assure compliance with the terms contained in the permit. (Silber-Florida)
W74-06204

RHODE ISLAND WATER RESOURCES BOARD.
R I Gen Laws Ann, secs 46-15-6, 46-15-13 (Supp 1972).

Descriptors: *Rhode Island, *Legislation, *Water resources, *Wells, *Drilling, Well regulations, Administrative agencies, Regulation, Planning, Resources, Subsurface waters, Subsurface investigations, Underground, Conservation, Administration.

The water resources board is authorized and empowered to require that no person, firm or corporation shall engage in the business of digging, drilling or constructing wells within the state unless said person, firm or corporation first registers with the board. The board, upon giving due notice of intent and purpose, without being liable for trespass, shall have the right and is authorized to enter in, over and onto any lands or waters in the state and bring any equipment and devices as may be necessary and appurtenant for the conducting of examinations, investigations, appraisals, surveys or other studies and for the making of test pits, pumping tests, borings, and other forms of geologic investigations. (Silber-Florida)
W74-06205

CONTAMINATION OF DRINKING WATER.
R I Gen Laws Ann, secs 46-14-1, 46-14-2, 46-14-4, 46-14-5 (Supp 1972).

Descriptors: *Rhode Island, *Legislation, *Water law, *Pollution control, *Water resources, Administrative agencies, Reservoirs, Lakes, Streams, Wells, Water supply, Water utilization, Water demand, Pollution abatement, Sewage disposal, Drainage, Water quality, Water quality control, Rivers.

No person shall throw or discharge into any well, spring brook, lake, pond, reservoir or stream used as a source of water supply for drinking purposes by any city, town, district, institution or company, or into any known tributary or feeder of any such water source, any sewage, drainage, refuse or other noxious matter or thing tending to pollute or corrupt or impair the purity of such waters, or render the same injurious to health. Nor shall any person bathe, swim, or wash any animal, clothing or any other article in any of the above mentioned waters. The bathing prohibition shall not apply to licensed camps or bathing resorts. The director of health when satisfied that any sewage, drainage or refuse or polluting matters exists in a locality such that there is danger that the condition may pollute or corrupt or impair the purity or quality of any of the above mentioned waters or render them injurious to health, may order the owner or occupier to desist from such practices. (Silber-Florida)
W74-06206

PROHIBITION OF WATER POLLUTION.
R I Gen Laws Ann, secs 46-12-4, 46-12-5, 46-12-14 (Supp 1972).

Descriptors: *Rhode Island, *Water law, *Legislation, *Water quality control, *Pollution, Pollution control, Pollution abatement, Sewage disposal, Waste water treatment, Waste water disposal, Sewage discharge, Administrative agencies, Water conservation, Water management, Water control, Water policy, Water pollution sources, Water pollution treatment.

It shall be unlawful for any person to cause pollution of any waters of the state Rhode Island or to cause sewage to be placed where it is likely to cause pollution, or to place any solid waste materials, junk or organic or non-organic debris of any kind in any stream, river, brook, pond or lake. The director of water resources upon approval of the system or means used, may permit treated sewage to be discharged into the state's waters. The director must also approve the construction and installation of any system or means to prevent pollution. It shall also be unlawful to construct or install any industrial, commercial or other establishment which may result in the discharge of any sewage into the state's waters unless approved by the director. The director shall investigate any situation he believes is in violation of this statute. (Silber-Florida)
W74-06207

A BILL TO AMEND TITLE II OF THE WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972 (PUBLIC LAW 92-500).
Senate Bill 2531, 93d Cong, 1st Sess (1973). 3 p.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Government finance, *Water pollution treatment, Water pollution, Construction, Treatment facilities, Water pollution control, Abatement, Sewage, Industrial wastes, Water storage, Water reuse, Sewers, Storm runoff.

This bill amends section 206 of the Water Pollution Control Act Amendments of 1972 (FWPCA) by adding new provisions. The bill provides that any project initiated after January 1, 1973, which did not receive federal grant support, shall be eligible for future reimbursement. Such projects, however, must be approved by the appropriate state water pollution control agency and by the Administration as meeting all applicable requirements of the FWPCA. An amendment has been proposed to the above bill, to provide for reimbursement for projects initiated after July 1, 1972. Section 212 of the FWPCA is also amended to redefine the term 'treatment works' by providing that the foundations and excavations related to those treatment works are included within the definition of that term. (Ritchie-Florida)
W74-06208

DRAINS AND DITCHES.
Tenn Code Ann, secs 70-501 through 70-506 (1932).

Descriptors: *Tennessee, *Legislation, *Land reclamation, *Drainage, *Swamps, Wet lands, Land development, Surface drainage, Drainage practices, Ditches, Surface waters, Watersheds, Marshes, Standing waters, Stagnant waters, Land tenure, Land use, Legal aspects, Land resources.

Swamp land drainage is a public improvement, conducive to the health of the inhabitants and wealth of the state of Tennessee. Whenever such lands, owned by one person, are surrounded by lands of others who refuse the privilege of cutting drains through their lands, and such drains are necessary to the reclaiming of the wet lands, the owner of the wet lands may apply to the county court by petition, upon five days notice to the adjoining proprietors, for a jury of veiw to mark out the line of drains across such adjoining lands, and to assess the damages done thereby. Upon the return of the jury, setting forth a plan of the grounds and the proposed drains, and assessing the damages, the court may make an order authorizing the petitioner to dig such ditches and keep them in repair, upon paying the damages assessed, together with all costs. No ditch shall run between the dwelling house and any outhouse, garden or orchard or within 100 yards of the dwelling house, without the consent of the owner of the land through which the ditch is to pass. (Silber-Florida)
W74-06209

WATER ENVIRONMENTAL HEALTH ACT.
Tenn Code Ann, secs 53-2029 through 53-2041 (1971).

Descriptors: *Legislation, *Water law, *Tennessee, *Water treatment, *Wastewater treatment, Water quality, Water quality control, Water supply, Water management Water conservation, Water pollution, Water pollution control, Waste water disposal, Waste treatment, Waste disposal, Water distribution, Sewage treatment.

It shall be unlawful for any person, firm, or corporation, either municipal or private, operating a water supply system or wastewater system, to operate the water treatment plant, wastewater treatment plant, or water distribution system unless the competency of the operator who is in direct responsible charge is duly certified by the commissioner of public health. A board of certification is established to advise and assist the commissioner in the administration of the certification program. The commissioner shall also classify all water treatment plants, wastewater treatment plants, water distribution systems and wastewater collection systems with due regard to their size, type, physical conditions affecting them and their distribution systems, and according to the skill, knowledge and experience that the operator must have to successfully supervise the operation of the plant or system so as to protect the public health. (Silber-Florida)
W74-06210

SOLID WASTE DISPOSAL.
Tenn. Code Ann., secs. 53-4301 through 53-4312 (1969).

Descriptors: *Tennessee, *Legislation, *Solid wastes, *Ultimate disposal, *Environmental sanitation, Waste disposal, Sewage disposal, Water quality, Water quality control, Land utilization, Land management, Water policy, Water pollution control, Water pollution abatement, Government, Waste treatment, Public rights, Legal aspects.
Identifiers: *Nuisance(Legal aspects).

The Tennessee Solid Waste Disposal Act was enacted to protect the public health, safety and welfare; prevent the spread of disease; conserve natural resources; and enhance the quality of the environment. It declares that depositing solid waste into the waters in a manner not approved by the stream pollution control board, the burning of solid wastes in an unapproved manner or the construction, alteration or operation of a solid waste processing or disposal facility in violation of regulations shall constitute a public nuisance. All solid waste processing or disposal facilities within the state must be registered with the commissioner. The department shall establish regulations for the operation and supervision of such solid waste processing and disposal facilities. This act shall not prohibit any person from disposing of his own solid wastes upon his own land provided such disposal does not create a public nuisance or a hazard to the public health. (Silber-Florida)
W74-06211

GAGE V. COMMONWEALTH EDISON CO. (SUIT AGAINST AEC AND AN ELECTRIC COMPANY FOR ALLEGED DEPRIVATION OF RIGHTS UNDER NEPA).
356 F. Supp. 80-88 (N.D. Ill., E.D. 1972).

Descriptors: *Judicial decisions, *Legal aspects, *Riparian rights, *Federal government, *Legislation, Environmental effects, Power plants, Administrative agencies, Administrative decisions, Water policy, Water law, Water utilization, Water demand, Environment, Land development, Regulations, Standards, Control, Management, Nuclear powerplants.
Identifiers: National Environmental Policy Act(NEPA).

A proceeding in the United States District Court was brought against the Atomic Energy Commission (AEC) and its members and an electric company for alleged deprivation of rights under the National Environmental Policy Act (NEPA). On motions of the AEC and the electric company to dismiss for lack of jurisdiction and for failure to state a claim upon which relief could be granted, the court held that the AEC's failure to perform an alleged duty imposed by the NEPA did not constitute a 'final agency order' within the section providing for appellate review of the validity of the AEC's order. The court also held that the AEC's failure to prepare an environmental analysis prior to the electric company's acquisition of land for a nuclear power plant was 'agency action,' but was not final in nature. Prior to the application for a construction license, there was no clear legal duty for the Commission to act. The motions were granted and the cause was dismissed without prejudice. (Silber-Florida)
W74-06212

A BILL TO DECLARE A NATIONAL POLICY THAT THE BEACHES OF THE UNITED STATES ARE IMPRESSED WITH A NATIONAL INTEREST AND THAT THE PUBLIC SHALL HAVE FREE AND UNRESTRICTED RIGHT TO USE THEM.
Senate Bill 2621, 93d Cong, 1st Sess (1973). 8 p.

Descriptors: *Legislation, *Beaches, *Public rights, *Legal aspects, Government financing, Access routes, Recreation, Recreational facilities, Transportation, Easements, Public access, Riparian land, Prescriptive rights, Boundaries(Property), Federal government, Government finance.
Identifiers: Injunctive relief.

The National Open Beaches Act states as its policy that the beaches of the United States are impressed with a national interest and that the public shall have free and unrestricted right to use them, consistent with the constitutionally protected property rights of littoral landowners. The bill would prohibit the construction or maintenance of any barrier which interferes with the public's right to use the public beaches. The Secretary of Transportation is authorized to provide financial assistance to any state for the development of transportation facilities necessary for the use of public beaches. An action shall be cognizable in the district courts, at the instance of the Attorney General or a United States district attorney to establish and protect the public right to beaches, determine the existing status of title, and condemn such easements as are necessary to accomplish the purposes of this Act. Such actions may be for injunctive, declaratory or other suitable relief. A showing that the area is a beach shall be prima facie evidence that there exists a prescriptive right to use it as a common. States may obtain financial assistance for the acquisition of interests in land designed to secure the right of the public to beaches. (Ritchie-Florida)
W74-06213

A BILL TO AMEND THE FISH AND WILDLIFE COORDINATION ACT TO PROVIDE FOR THE PRESERVATION OF NATURAL GAME FISH STREAMS.
House Bill 3830, 93d Cong, 1st Sess (1973). 5 p.

Descriptors: *Streams, *Pollutants, *Fisheries, *Legislation, Fish management, Water pollution treatment, Federal agencies, State agencies, Legal aspects, Stream improvement, Environmental protection, Stream stabilization, Streambeds, Beds, Water law, Financing, Recreation, Fish, Fish populations, State governments.

The Natural Game Fish Stream Preservation Act of 1972 proposes an amendment to the Fish and Wildlife Coordination Act. In the national interest of preserving the endangered natural game fish streams and their native fish populations, federal assistance must be provided. The amendment provides necessary definitions of terms used in the section. State agencies responsible for the management of game fish shall apply to the Secretary of the Interior for assistance. If the determination is made that the preservation of the stream in question is consistent with the amendment, funds may be granted. A grant is contingent upon the state's showing that the taking of fish and the maintenance of the stream and its immediate environs will be regulated. Any state receiving assistance under this act shall appoint a citizens' advisory committee, which shall file an annual report with the Secretary of the Interior with respect to the rules, supervisory practices and use of all natural game fish streams for which assistance has been provided. (Proctor-Florida)
W74-06214

A BILL TO PROVIDE FOR THE CONSERVATION AND MANAGEMENT OF FISHERIES AND FOR OTHER PURPOSES.
House Bill 4756, 93rd Cong, 1st sess. (1973).

Descriptors: *Fish, *Fish management, *Fish conservation, *Federal government, *Fisheries, Legislation, Commercial fishing, Ecology, Administration, Inter-agency cooperation, Government finance, Water resources development, Nonstructural alternatives, Federal jurisdiction, Federal-state water rights conflicts.
Identifiers: *Enforcement.

The fishing management and conservation zone which the act will encompass is that zone contiguous to the territorial sea of the U.S., and the act will be administered by the Secretary of Commerce. The Secretary will have the power to promulgate zone regulations as to where and when no fishing will be permitted, size and catch limits regarding fish species, prohibition of certain types of fishing gear, and any others deemed necessary. The act sets forth the rules under which these regulations may be promulgated. State regulations can be adopted as federal regulations by the Secretary if they will achieve the act's objectives, taking into account uniformity with other regulations. Provisions are made for cooperation with the Secretary of State and other agencies concerning negotiations with contracting parties in regard to further measures for the conservation of living resources of the high seas. Prohibitions and penalties are set forth including fine limitations for different offenses. Enforcement within the fisheries zones will be by the Secretary, and the Coast Guard, with the federal district courts having exclusive jurisdiction concerning such matters. State jurisdiction shall not be restricted and appropriations shall be made available. (Sutton-Florida)
W74-06215

DRAINAGE, FLOOD AND POLLUTION CONTROL.
Ill. Ann. Stat., Ch. 42, sec. 472 (Smith-Hurd Supp 1973).

Descriptors: *Illinois, *Legislation, *Drainage, *Watershed management, *Flood control, Drainage systems, Hydrography, Water control, Flood protection, Hydrology, Controlled drainage.

The Department of Transportation is directed to make a survey and prepare a master plan for the drainage and flood control of all watershed areas of the State of Illinois and for lessening or avoiding hazards to persons and damage to property from flood waters. The plan shall set out the hydrography of each watershed area including rainfall and runoff, frequency and severity of floods, estimates of flood heights for purposes of planning and regulation of development within and along flood water channels, frequency and degree of low flows and drainage of upland and bottom land and urban areas. Whenever a plan for the drainage and flood control of any particular watershed area has been prepared it shall be made available to private interests and public agencies having drainage powers in the development of drainage projects. (Sears-Florida)
W74-06216

A BILL TO AUTHORIZE THE ESTABLISHMENT OF THE FLORIDA FRONTIER HISTORIC RIVERWAY, AND FOR OTHER PURPOSES.
House Bill 1719, 93d Cong, 1st sess (1973).

Descriptors: *Federal project policy, *Administration, *Legislation, Estuaries, *Estuarine environment, Federal government, *Florida, Financing, Project planning, Water resources development, Project purposes, River basin development, Planning, Area redevelopment, Surface waters, Water resources.
Identifiers: *Nassau River estuary(Fla).

The Nassau River estuary has a setting and natural environment that is virtually unimpaired and possesses important scenic, ecological and scientific values. It would be in the national interest to preserve this estuary and associated historic sites and buildings. Appropriate funds are authorized to carry out this project and administration will be under the auspices of the Secretary of the Interior. The Secretary is authorized to acquire by donation, purchase or exchange not more than 15 thousand acres of land, water, and interests subject to certain limitations, and shall maintain administrative and information facilities thereon. After acquisition of sufficient lands to insure the realization of the Act, the Secretary shall establish the Florida Frontier Historic Riverway by publication in the Federal Register. The Secretary shall study and may designate additional sites from incorporation within the Riverway, some of which are listed. Administration will be under the Secre-

tary, and recreational activities shall be permitted, except that he may designate zones and periods when such activities will not be allowed. (Sutton-Florida)
W74-06217

SUPERVISION OVER LOCAL SANITATION.
W. Va. Code Ann., sec. 16-1-9 (1973).

Descriptors: *West Virginia, *Legislation, *Sewage disposal, *Sewage treatment, *Waste disposal, Water supply, Wastes, Water pollution sources, Waste water treatment, Waste water disposal, Sanitation, Sanitary engineering, Environmental engineering, Water quality, Water quality control, Drainage, Public health.

No person, firm, company, corporation, public or private institution, county or municipality shall install or establish any system or method of drainage, water supply, sewage or excreta disposal, or solid waste disposal without first obtaining a written permit from the West Virginia director of health. All such systems or methods shall be installed or established in accordance with plans, specifications and instructions issued by the state director of health. Whenever the director finds that the system or method has not been installed according to plans, specifications or instructions issued by him, he may issue an order requiring the owner to make alterations as may be necessary to correct the condition. The presence of sewage, excreta or solid waste being disposed of in a manner not approved by the director shall constitute prima facie evidence of the existence of a condition endangering public health, constituting a misdemeanor. (Silber-Florida)
W74-06218

MUNICIPALITIES--WATER MAINS.
Conn. Gen. Stat. Ann. sec. 7-137c (Supp. 1972), as amended, Act 73-446, sec. 7-137c (1973). Pub. Acts of Conn.

Descriptors: *Connecticut, *Conduit, *Hydraulic structures, *Government finance, *Tax rate, Operating costs, Appraisals, Assessments, Concrete pipes, Water conveyance, Cost sharing, Separable cost allocation, Legislation, State governments, Legislation, Legal aspects, Zoning, Taxes, Cities, Governments.
Identifiers: *Administrative regulations.

Any Connecticut municipality may appropriate funds to extend water mains into industrial, commercial, or residential areas and assess adjoining property owners for costs incurred. Each owner of property abutting such main shall reimburse the municipality for his proportionate share assessed according to rules adopted by each municipality. The only exception is for unimproved land, and deferment from payment will cease when the land is built upon or a building permit is issued. Record of this deferred assessment is to be kept by the municipality on its land records. The assessment represents a reasonable proportion of the total cost of such mains, including materials, installations and pumping stations. If the use of the land does not conform with its zoning classification, the assessment will be made on another equitable basis. If the water main is to be used for municipal purposes, the municipality shall contribute a fair proportion of the expense. The owner of any assessed land can appeal his assessment to the county court within sixty days. (Sperling-Florida)
W74-06219

NAVIGATION--BOATING SAFETY AND REGULATIONS.
Conn. Gen. Stat. Ann. secs 15-121, 15-125, 15-155, 15-156 (Supp. 1972), as amended, Act 73-257, secs 1, 3, 20, 21, 22, 23, 24, 25 (1973), Pub. Acts of Conn.

Descriptors: *Connecticut, *Statute, *Boating, *Recreation, Legislation, State governments, Oily water, Water pollution sources, Environmental sanitation, Public health, Buoys, Administration, Costs, Administrative agencies, Regulation, Water, Navigable waters, Navigation, Water resources, Water pollution control, Water law.
Identifiers: *Administrative regulations, *Navigation, Obstructions.

The Connecticut Commissioner of Environmental Protection has power to investigate matters relating to boating sanitation. He can adopt regulations to provide for public safety and environmental quality and to promote the safe use and protection of waters. Anyone aggrieved by an order of the Commissioner may appeal to the county court. State fees for registering of motor boats go into a fund from which expenses of the Commissioner of Environmental Protection are paid. Also, any town which incurs an expense in enforcing regulations on pollution from vessels can be reimbursed from this fund. The Commissioner will examine requests for reimbursement and allow those which are reasonable and necessary. The Commissioner can cause to be removed any marker, raft, etc. in any waters of the state which he finds to be a hazard to public use or a menace to navigation. (Sperling-Florida)
W74-06220

HARBORS AND RIVERS.
Conn. Gen. Stat. Ann. secs. 15-1, 15-2, 15-7, 15-8, 15-13 to 15-15B, 15-19, 15-21, 15-25, 15-26a (Supp. 1972), as amended, Act 73-486, sec. 15-1, Act 73-405, secs. 1,2,3,4 (1973), Pub. Acts of Conn.

Descriptors: *Connecticut, *Legislation, *Harbors, *Port authorities, *Ports, Water law, Navigation, Pollution control, Pollution abatement, Water quality, Water quality control, Rivers, Streams, Water policy, Multiple-purpose projects, Transportation, Ships, Reasonable use, Tidal waters, Permits.
Identifiers: Harbor masters.

The governor of Connecticut is directed to appoint harbor masters for the major harbors and ports of the state. The harbor masters shall be responsible for the general care and supervision of their harbor and its tidewaters, rivers and flats, to prevent and abate sources of water pollution and to prevent or remove unauthorized encroachement and other obstructions likely to interfere with navigation. They shall also have the power to station all vessels at anchor within the harbor under their authority. The Commissioner of Environmental Protection may license as many citizens as he deems necessary and finds qualified to act as pilots in any ports and waters of the state. All inward and outward bound vessels of foreign or American registry, drawing nine (9) or more feet of water, entering or departing from any port in this state, shall require a licensed pilot. (Silber-Florida)
W74-06221

GAME AND FRESH WATER FISH.
Fla. Stat. Ann. sec. 372.85 (Supp. 1973).

Descriptors: *Mining, *Legislation, *Water pollution, *Water pollution control, *Law enforcement, Administration, Legal aspects, Florida, Water pollution sources, Water quality, State governments, Abatement, Pollutant identification, Oil wastes, Mine wastes, Fish conservation, Sawdust, Dyes, Poisons.

Contamination is prohibited of the fresh running waters of the state of Florida with quantities of deleterious substances sufficient to injure, stupefy or kill fish inhabiting those waters. An exception is provided for those persons or businesses engaged in the mining industry as long as precautionary measures approved by the Game and Fresh Water Fish Commission are observed. Violation of there provisions is a second degree misdemeanor (Sutton-Florida)
W74-06222

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
Federal Register, Vol 38, No 7, p 1362-70 (1973).

Descriptors: *Legislation, *Regulations, *Permits, *Discharge, *Pollutants, Administrative agencies, Control, Waste discharge, Sewage discharge, Effluents, Sewage treatment, Waste treatment, Industrial pollutants, Industrial wastes, Water quality control, Navigable waters, Oceans, Standards, Water pollution, Water pollution sources, Pollution abatement, Pollution control, Impaired water quality, Legal aspects, Water law, Water policy.
Identifiers: Contiguous zone.

The Environmental Protection Agency (EPA) has proposed regulations to serve as guidelines for the issuing or denial of pollution discharge permits pursuant to the Federal Water Pollution Control Act Amendments of 1972. Permit holders are required to achieve by July 1, 1977 effluent limitations which require the application of the best practicable waste control technology currently available. Publicly owned treatment works are required to achieve secondary treatment by the same date. In addition, all point source dischargers must comply with applicable water quality standards requirements. All discharges from point sources into the navigable waters, waters of the contiguous zone, and the oceans are unlawful unless the discharger possesses a valid permit or is excluded from coverage by law. Any discharge of sewage sludge that results in any pollutant from sewage sludge entering the navigable waters is prohibited. (Silber-Florida)
W74-06223

WATER AND SEWER SYSTEM REGULATORY LAW.
Fla. Stat. Ann., secs. 367.011 through 367.181 (Supp. 1973), as amended, act 193, sec. 1, act 333, sec. 100 (1973) Fla. Laws.

Descriptors: *Florida, *Public utility districts, *Water distribution(Applied), *Governments, Water quality, Public health, Public utilities, Water rates, Distribution patterns, Drainage systems, Sewer, Water conservation, Water management(Applied), Legislation, Regulation, Water quality standards, Sewage treatment, Water.
Identifiers: *Administrative regulations, *Certification.

The Florida public service commission is given exclusive jurisdiction over each utility operating water and sewer systems with respect to its authority, service, and rates. Exempted from regulation under this statute are the bottled water industry, governmentally owned water and sewer systems, systems designed to serve fewer than one hundred persons, non-profit corporations, as well as some other systems. Each utility is required to obtain a certificate authorizing it to provide service. The statute specifies the application procedure and what the application should contain, as well as provisions for a hearing if an objection is expressed to the application. No certificate will be issued for a new system or an extension of an old system unless the present facility is inadequate. Also, no transfer of facilities or organizational control can take place unless the commission deems it to be in the public interest, and rates cannot be changed without commission approval. The commission also has power to regulate standards of quality, service, repairs and improvements. The commission may enter the premises of any utility and investigate and conduct tests, or exercise any power conferred by this statute. (Sperling-Florida)
W74-06224

SUPERVISORY UNIONS.
Vt. Stat. Ann., Title 10, secs. 451-457 (1968).

Descriptors: *Vermont, *Legislation, *Adoption of practices, *Coordination, *Management, Administrative agencies, Regulation, Conservation, Natural resources, Water, Water resources.

Natural resources conservation districts in Vermont are authorized to form supervisory unions for administrative purposes while still retaining their individual identities, duties and powers. The unions will help carry out a broadened program of conservation, development and use of natural resources, as well as coordinating and cooperating with state, federal and local agencies. A union may be formed by petition of two or more districts to the state natural resources conservation council, and the subsequent determination by the council that such a union is feasible and in the best public interest. The union shall offer appropriate assistance to member districts, employ a union conservationist, enter into agreements with other agencies in planning for the conservation, development and use of natural resources. The union conservationist shall implement programs of the member districts and perform the duties as set by the directors. He shall endeavor to coordinate programs and plans for the member districts as well as report to the directors on his activities and the needs of the districts within the union. (Siber-Florida)
W74-06225

PRIVATE SEWER SYSTEMS.
Ohio Rev. Code Ann. secs 6112.01-6112.04 (Supp. 1972).

Descriptors: *Ohio, *Sewage, *Sewage treatment, *Legislation, *Water law, *Water pollution control, Waste disposal, Waste treatment, Public utilities, Environmental engineering, Structural design, Treatment facilities, Waste, Pollution abatement, Water quality control, Sewer districts.

The Ohio director of environmental protection upon receipt of an application from any person, may determine on the basis of public health, safety, convenience or welfare the necessity for approving general plans for the construction and installation of a disposal system for the disposal of sewage, industrial waste or other wastes. For the purpose of preventing, controlling and abating new or existing pollution of the waters of the state, the plans may serve any geographical area in one or more counties provided that area is not already being served by a sewage disposal system. To be approved by the director, the plans must be accompanied by written certification from the public utilities commission authorizing the construction, installation and operation of such facilities. The construction of approved facilities shall be performed under supervision of a registered engineer, in a manner acceptable to the director, and at the applicant's expense. (Silber-Florida)
W74-06226

WATER POLLUTION CONTROL AND PUBLIC WATER SUPPLY.
Ohio Rev. Code Ann., secs. 6111.12-6111.30, 6111.41-6111.46, 6111.99 (Supp. 1972).

Descriptors: *Water pollution control, *Watershed management, *Ohio, *Impaired water quality, *Public health, Fluoridation, Flood plain, Water pollution sources, Water resources, Water conservation, Flood control, Recreation, Flood plain zoning, Water supply, Water quality, Legislation, Administrative agencies.
Identifiers: *Administrative regulations, Nuisance.

Whenever there is filed with the environmental protection agency a complaint, in writing, that a public water supply is impure, dangerous, or does not contain requisite amounts of fluoride, there will be an investigation by the director of environmental protection. The environmental protection agency supervises operation and maintenance of all water systems, public, and private if of a public or quasi-public nature. Fluoridation of the water supply can by petition be put on the ballot of a special election. Water-works systems are required to have analysis made of the water at such intervals as the environmental protection agency may order. If the agency orders changes to be made in the system that will make the water systems operation less profitable, an application can be made to the public utilities commission for rate increases. Plans for development, use, and protection of water resources shall be made including recreation, fish, wildlife, flood control, and flood plan management. The agency will also collect, study, and interpret all data pertaining to the supply use, conservation, and replenishment of the underground and surface waters of the state, and shall give such information to anyone who asks for it. The agency will approve all plans for changes in existing systems, new systems, as well as plans for disposal of waste. (Sperling-Florida)
W74-06227

LOCAL RIVER MANAGEMENT.
Mich. Comp. Laws Ann. secs 323.301-323.320 (Supp. 1973).

Descriptors: *Legislation, *Michigan, *Water management, *River regulation, Water law, waste water disposal, Water conservation, Water utilization, Reservoir operation, Flood control, Water levels, Reservoirs, Rivers, Levees, Dams, Water resources, Flow, Water distribution, Water control, Water storage.

The Michigan Watershed Council shall be established to promote cooperation among local governments in river management. The Council May conduct studies of water resources, water uses and streamflow levels. It may advise federal, state and local agencies on the watershed's problems and needs, and cooperate with those agencies in their undertakings of various tests and studies. Two or more local governments may petition the Water Resources Commission to establish a River Management District. The District will serve as the agency to acquire, construct, operate and finance water storage and other river control facilities necessary for river management. A district board may conduct studies necessary to make their functions operational, impound and control river waters subject to the minimum streamflow levels, operate reservoirs, and perform the functions of the Council if a council has not been formed within the district. The Commission shall determine the minimum stream flow level for each district necessary to safeguard the public health, welfare and safety. No river management plan shall take effect until approved by the Commission. (Silber-Florida)
W74-06228

WATER RESOURCES COMMISSION.
Mich. Comp. Laws Ann., secs. 323.1 through 323.13 (Supp. 1973), as amended, act 3, sec. 1 (1973) Mich. Pub. Acts.

Descriptors: *Water resources, *Water quality control, *Michigan, *Pollution(Water), *Water pollution control, Conservation, Wastes, Discharges, Legislation, Rivers, Floodways, Permits, Regulation, Administrative agencies, State governments, Governmental interrelations, State jurisdiction, Water pollution sources.
Identifiers: Administrative regulations.

A water resources commission is created to protect and conserve the water resources of the state of Michigan. The commission has control over the pollution of any waters of the state and over the alteration of the watercourses and the flood plains of all rivers and streams. The commission also has the power to make rules governing the water resources of the state. The commission requires registration of manufacturing products, production materials and waste products for all operations in which wastes are discharged. It also requires permits to regulate the discharge or storage of any substance which may affect the quality of the waters and is authorized to establish permit restrictions and programs to assure compliance with applicable federal and state law. The commission is given the power to prohibit pollution of the state's waters, to prohibit the obstruction of floodways of the rivers and streams of the state, and to negotiate with other governments or agencies in matters concerning the water resources of the state. Penalties for violations are provided. (Daniels-Florida)
W74-06229

RUCKER V. WILLIS (SUIT TO ENJOIN CONSTRUCTION).
484 F.2d 158-164 (4th Cir. 1973).

Descriptors: *Judicial decisions, *Construction, *Habitats, *Ecology, Environment, Appeals, Governmental interrelations, *North Carolina, Legal aspects, Balance of nature, Environmenal engineering, Project planning, Wildlife conservation, Scenery, Economics, Environmental effects, Marinas, Coasts, Shores, Piers, Engineering structures, Legislation.
Identifiers: Injunctive relief, National Environmental Policy Act(NEPA), Environmental impact statement(EIS).

The plaintiffs seek to enjoin construction of a marina and pier alleging that the Army Corps of Engineers acted in violation of 33 U.S.C. sec 403 (1972) in issuing a construction permit without first preparing an environmental impact statement. The court affirmed the District Court's ruling that issuance of the permit was legal in light of the applicable statute, and applicable regulation, both requiring an environmental impact statement if their conditions are met, but do not require a negative finding or statement. The court also held 'controversial' not to be synonymous with 'opposition', and in light of all the circumstances such as the project's isolated nature, lack of involvement with marshlands, or destruction of shellfish beds, and the fact that similar structures had already been constructed, the Corp's actions were therefore not arbitrary and no abuse of discretion was evident. The opinion also noted the compliance with the notice requirement. The dissenting opinion noted that since the construction could ultimately affect the environmental nature of the area concerned, an injunction should be issued pending a trial on the merits. (Sutton-Florida)
W74-06230

THE LONG LITTERED PATH TO CLEAN AIR AND WATER,
For primary bibliographic entry see Field 5D.
W74-06234

STANDARDIZATION IN HYDROLOGY AND RELATED FIELDS.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 7C.
W74-06298

AIRTEX PRODUCTS, INC. V. POLLUTION CONTROL BOARD (AN APPEAL FROM AN AGENCY IMPOSED FINE FOR DISCHARGE OF CYANIDES INTO SEWER SYSTEM).
303 N.E.2d 498 (Ill. Ct. App. 1973).

Descriptors: *Illinois, *Judicial decisions, *Legal aspects, *Water pollution, *Sewage treatment, Water pollution sources, Sewers, Sewage disposal, Sewage, Industrial wastes, Water pollution treatment, Regulation, Penalties(Legal), Administrative agencies, Constitutional law, Water

quality, Pollutants, Toxins, Industrial pollution, Municipalities, Pollution abatement, Water quality control.
Identifiers: *Cyanides.

The Illinois Environmental Protection Agency brought enforcement action against a corporation for alleged violations of a regulation relating to discharge of cyanides in municipal sewer systems and sewer treatment works. The state's Pollution Control Board imposed a fine for that violation and the Corporation appealed, presenting numerous contentions. First, the petitioner contended that the imposition of a discretionary penalty is a judicial and not an administrative function, thereby violating the separation of powers doctrine of the Illinois Constitution. The District Court agreed. Secondly, it was asserted that the regulation was unconstitutional as an unlawful delegation of legislative authority. The Court held that the regulation was reasonably related to accomplishing the purpose of the Environmental Protection Act, that is, maintaining the purity of the water. Third, the corporation contended that the regulation was unconstitutional because property is taken without due process. Appellant argued that the right to connect to the city sewer system is a property right which cannot be divested, but the Court held that such right was subject to reasonable regulations. Procedural objections were also made and were dismissed by the Court. (Ritchie-Florida)
W74-06323

EPPS V. FREEMAN (ACTION TO CLEAR TITLE ON FILLED SWASH AREAS BETWEEN PROPERTY AND THE SEA).
200 S.E.2d 235 (S.C. 1973).

Descriptors: *Judicial decisions, *South Carolina, *Legal aspects, *Riparian rights, *Easements, Coasts, Recreation, Consititutional law, Navigable waters, Adverse possession, Accretion(Legal aspects), Bulkheads, Boundary disputes, Boundaries(Property), Land use, Land reclamation, Land development, Water policy, Water law.
Identifiers: *Swash areas.

Persons claiming by will or inheritance under subdividers of a tract of ocean front property brought an action against lot owners in the subdivision to clear the title to areas in the subdivision between the platted lots and the sea. The Supreme Court of South Carolina held that evidence of sporadic efforts by the lot owners to fill a swash area between the lots and the sea, and use by them of the swash area for recreational purposes, was insufficient to show title by prescription or accretion. But while the lot owners therefore did not have title to the land in dispute, they had a speical property interest therein, whether by implied grant, estoppel or otherwise, which barred plaintiffs from the relief sought by the complaint. Generally, where property sold is described in the conveyance with reference to a plat on which streets, parks and other open areas are shown, an easement therein is created in favor of the grantee. Such an easement is part of the property to which the grantee is entitled and of which he cannot be divested except by due process of law. (Ritchie-Florida)
W74-06324

WETLANDS.
Va. Code Ann., sec. 62.1-13.1 thru 62.1-13.20 (1972).

Descriptors: *Virginia, *Water policy, *Legislation, *Wetlands, *Conservation, Wildlife habitat, Aquatic habitat, Flood control, Erosion control, Land use, Land development, Recreation, Wildlife conservation, Environmental effects, Ecology, Marshes, Ecosystems, Biological communities, Estuaries, Pollution control, Pollution prevention, Natural resources, Water resources development.

The unique character of the wetlands is recognized as an irreplaceable natural resource, which in its natural state, is essential to the ecological systems of the tidal rivers, bays and estuaries of the state of Virginia. This resource is essential for the production of marine and inland wildlife, waterfowl, finfish, shellfish and flora, is a valuable and protective barrier against floods, tidal storms and erosion of the shore and soils as well as an absorber of silt and pollutants. Continued destruction of the state's coastal wetlands will greatly contribute to the pollution of its rivers, bays and estuaries, diminish the abundance of plant and wildlife as food sources and deprive the state of employment and recreational resources. To protect these essential resources it is declared to be the policy of the state to preserve the wetlands and to prevent their despoilation and destruction and to accomodate necessary economic development in a manner consistent with wetlands preservation. Wetlands of primary ecological significance shall not be altered so that the ecological systems are unreasonably disturbed and any development shall be concentrated in wetlands of lesser ecological significance. (Silber-Florida)
W74-06325

SHORE EROSION CONTROL.
Va. Code Ann., secs. 21-11.16 thru 21-11.19 (1972).

Descriptors: *Virginia, *Erosion control, *Legislation, *Water control, *Land management, Water policy, Conservation, Bank protection, Soil management, State governments, Administrative agencies, Coordination, Cooperation, Water quality, Water quality control, Environmental effects, Project purposes, Project planning, Land development, Recreation, Water resources, Water resources development.

The shores of the state of Virginia are a most valuable resource that should be protected from erosion, which reduces the tax base, decreases recreational opportunities and decreases the amount of open space and agricultural lands. Shore erosion also damages or destroys roads, produces sediment that damages marine resources, fills navigational channels, degrades water quality and in general, adversely affects the quality of the environment. The Virginia Soil and Water Conservation Commission shall have the duty and responsibility to make the necessary coordination of shore erosion control programs throughout the state and to secure the cooperation and assistance of the United States to protect waterfront property from destructive erosion. The Commission shall evaluate the effectiveness of current programs and explore all facets of the problem and alternative solutions to determine the most practical and economic methods to control shore erosion. The Commission is authorized to employ one shore erosion engineer to assist in carrying out the coordination responsibility of shore erosion programs and to provide technical assistance to soil and water conservation districts. (Silber-Florida)
W74-06326

A BILL TO AMEND THE WILD AND SCENIC RIVERS ACT BY DESIGNATING SEGMENTS OF CERTAIN RIVERS IN THE STATE OF COLORADO FOR STUDY AS POTENTIAL COMPONENTS OF THE NATIONAL WILD AND SCENIC RIVERS SYSTEM.
House Bill 11698, 93rd Cong, 1st Sess (1973). 3 p.

Descriptors: *Rivers, *Legislation, *Legal aspects, *River systems, *Conservation, Water resources development, Natural resources, Preservation, Financing, Projects, Project planning, Water law, Water policy, Scenery, Aesthetics, Wild rivers.
Identifiers: National Wild and Scenic Rivers Act.

The Colorado Rivers Preservation Act of 1973 designates segments of certain rivers in the state of Colorado for study as potential components of the National Wild and Scenic Rivers System. Segments proposed to be included in the system, include North Platte River, Green River, Yampa River, Gunnison River, Big Thompson River, Poudre River, Los Pinos River, Conejos River, Elk River, Laramie, Michigan River, Piedra River and Encampment River. A segment of the Dolores River has been suggested for inclusion, provided that such classification does not inhibit any development or project planned at the time of enactment, proposed or conducted by the state of Colorado or the federal government. Necessary appropriations have been authorized to carry out this Act, not to exceed $2,250,000. (Ritchie-Florida)
W74-06327

DEPARTMENT OF FISH AND WILDLIFE.
N.Y. Environmental Conservation Law, sec. 11-0303, p. 164-165 (1972).

Descriptors: *New York, *Legislation, *Natural resources, *Environment, *Ecology, Fish, Wildlife, Habitats, Habitat improvement, Recreation, Public rights, Public health, Interagency cooperation, Wildlife management, Fish management, Conservation, Planning, Aquatic habitats.

New York has granted to the department of fish and wildlife powers necessary for efficient management of fish and wildlife resources of the state. These resources are deemed to include all animal and vegetable life and the soil, water and atmosphere owned or managed by the state, to the extent that they constitute the habitat of fish and wildlife. Management includes both the maintenance and improvement of these resources as well as the development and administration of measures for making them accesible to the people of the state. The department is empowered to cooperate with the federal government and with other political subdivisions within the state, as well as with owners and lessees of privately owned lands and waters. The department shall also develop programs to promote natural propagation and maintenance of desirable species. In so doing, it shall take into account the following: ecological factors, including the need for restoration and improvement of natural habitats; the compatibility of production and harvesting of fish and wildlife crops with other necessary or desirable land uses; the importance of such resources for recreational purposes; requirements for public safety; and protection of private premises for hunting, fishing or trapping. (Ritchie-Florida)
W74-06328

UNITED STATES OCEANS POLITICS,
Johns Hopkins Univ., Washington, D.C. School of Advanced International Studies.
A. L. Hollick.
San Diego Law Review, Vol 10, No 3, p 467-501, May 1973. 2 tab, 44 ref.

Descriptors: *Political constraints, *Law of the Sea, *Continental shelf, *Oceans, *Governmental interrelations, Administration, Coasts, Federal government, International law, Treaties, Law enforcement, Jurisdiction, Organizations, Industries, Commercial fishing, Oil industry, United States, United Nations.

The U.S. policy with regard to seabed minerals favors a narrow zone of national jurisdiction and establishment of an international seabed regime beyond this zone. The 200 meter isobath national jurisdiction brought some dissatisfaction, therefore the policy provisions have been delineated by administrative machinery. The best way to examine oceans policy is in keeping the typical bureaucratic political model in mind. The history of U.S. seabed policy and conflicts within the two main groups, the petroleum industry and the Defense Department are described. After many failures, the National Security Council adopted

the State Department compromise regarding seabed policy, whose principal strategy was to encourage other nations to adopt a narrow Continental Shelf policy. The U.S. stance on Territorial Sea, Straits and Fisheries Policy is outlined. At the U.N. Law of the Sea Conference hopefully the U.S. will realize the desired tradeoffs; a narrow Continental Shelf for a generous seabed regime and freedom of transit. The domestic perspective is outlined and the effects of military interest, shift of position in industry and the energy crisis, are discussed. The net effect, while seemingly evolving toward a coastal state approach with greater support in legislation, is difficult to ascertain at present. (Sutton-Florida)
W74-06329

WATER QUALITY MAINTENANCE,
Eastern Associated Coal Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 5G.
W74-06330

ENVIRONMENTAL LAW--ZONING--ORDINANCE PROHIBITING FILLING WETLANDS ADJACENT TO NAVIGABLE WATERS WITHOUT PERMIT IS CONSTITUTIONAL EXERCISE OF POLICE POWER NOT REQUIRING PAYMENT OF COMPENSATION.
Harvard Law Review, Vol 86, p 1582-1592, 1973. 56 ref.

Descriptors: *Wetlands, *Legal aspects, *Constitutional law, *Zoning, *Eminent domain, Public rights, Navigable waters, *Wisconsin, Judicial decisions, Regulation.
Identifiers: Just compensation.

The constitutionality is discussed of zoning ordinances designed to protect wetlands but which are attacked as being a taking without just compensation. The center of discussion is a Wisconsin case. By adopting a broad definition of harm in a case where public rights infringed by the private landowners are traditional and clear, the case suggests a mechanism by which strict regulation of wetlands use, or of other land uses affecting the public interest in navigable waters, might be upheld even though the regulations provide for no compensation to the property owners. Whether a later court will reach the same outcome when less well-established public rights to protection of the environment are involved remains an open question, although the instant court's expansion of the concept of harm certainly permits movement in that direction. The issue is important for states and municipalities since a requirement that the owner be compensated for use restrictions imposed on wetlands makes preservation of such areas considerably less likely. (Sears-Florida)
W74-06331

PROBLEMS OF CHOOSING IRRIGATION TECHNIQUES IN A DEVELOPING COUNTRY,
Pahlavi Univ., Shiraz (Iran). Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W74-06333

AQUACULTURAL DEVELOPMENTS IN PERU,
Auburn Univ., Ala. International Center for Aquaculture.
For primary bibliographic entry see Field 3F.
W74-06353

RIVER BASIN PLANNING AND THE FOREST INDUSTRY--COMPROMISE OR CONFLICT,
Saint John River Basin Board (New Brunswick).
For primary bibliographic entry see Field 6B.
W74-06398

6F. Nonstructural Alternatives

A BILL TO EXPAND THE NATIONAL FLOOD INSURANCE PROGRAM BY SUBSTANTIALLY INCREASING LIMITS OF COVERAGE AND TOTAL AMOUNT OF INSURANCE AUTHORIZED TO BE OUTSTANDING AND BY REQUIRING KNOWN FLOOD PRONE COMMUNITIES TO PARTICI PATE IN THE PROGRAM AND FOR OTHER PURPOSES.
For primary bibliographic entry see Field 6E.
W74-06179

6G. Ecologic Impact Of Water Development

LITTLE CREEK WATERSHED PROJECT, LAURENS AND WHEELER COUNTIES, GEORGIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Athens, Ga.
For primary bibliographic entry see Field 4D.
W74-05996

GROUND WATER PROBLEM AT NIOBRARA, NEBRASKA AND THE NIOBRARA STATE PARK (FINAL ENVIRONMENTAL STATEMENT).
Army Engineer District, Omaha, Neb.
For primary bibliographic entry see Field 4A.
W74-06001

BURNT CREEK RC AND D MEASURE FOR FLOOD PREVENTION (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Bismarck, N. Dak.
For primary bibliographic entry see Field 4A.
W74-06002

PROPOSED BIG CYPRESS RESERVE, FLORIDA.
For primary bibliographic entry see Field 6E.
W74-06005

HOW EFFECTIVE ARE ENVIRONMENTAL IMPACT STATEMENTS.
Oregon State Univ., Corvallis. Water Resources Research Inst.
Available from the National Technical Information Service as PB-230 702; $4.00 in paper copy, $1.45 in microfiche. Seminar WR 017.73, Papers presented in Spring Quarter 1973, published July 1973. 85 p, 11 fig, 5 tab, 28 ref.

Descriptors: *Environmental control, *Environmental effects, *Project planning, *Decision making, Safe yield, Social participation, Inter-agency cooperation, Regional development, Social impact, Adoption of practices, Legislation, Federal government.
Identifiers: *Environmental impact statements.

The Environmental Impact Statement is defined, its effects on the policies and programs of the Atomic Energy Commission, Bureau of Reclamation, Corps of Engineers, and the Oregon Highway Division examined, and suggestions are made on ways to improve the statements. The 1969 Environmental Policy Act (NEPA) requires that Environmental Impact Statements be prepared for projects significantly affecting the natural and human environment. The Council on Environmental Quality, also created by NEPA, has limited responsibilities in aiding in their preparation; the Council cannot demand preparation of the statement, neither can it order changes in proposed projects. Criticism of the statements centers on their failure to define impacts to be studied, to provide measurement tools, and to increase local participation in environmental planning. While the statements have forced agencies to be aware of environmental impacts, the increased workloads have caused the statements to be a separate rather than an integral part of the planning process. The development of a composite score, formed by examining the project's impact on the ecology, economy, and health and safety of the region is suggested as one way of selecting the best alternative. Regional information gathering systems are proposed to better integrate environmental impacts and public concern into the planning process. (See W74-06108 thru W74-06116) (Schroeder-Wisconsin)
W74-06107

WHAT IS AN ENVIRONMENTAL IMPACT STATEMENT,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
P. C. Klingeman.
In: How Effective are Environmental Impact Statements, Oregon State Univ., Corvallis, Water Resources Research Institute Seminar WR 017.73, July 1973. p 1-9.

Descriptors: *Environmental control, *Environmental effects, *Project planning, Federal government, State governments, Decision making, Legislation.
Identifiers: *Environmental impact statements.

An environmental impact statement evaluates a proposed project's impact on the natural and human environment and is a requirement of the 1969 National Environmental Policy Act. The document is submitted to other agencies for review and comment. The revised document along with the reviewers' comments are submitted to the Council of Environmental Quality. The Council, however, has no power to change the character of the project. Enforcement of proposed changes rests, at present, on public opinion and court action. The statement consists of a description of the proposed action, of existing conditions, of resultant alterations of existing conditions, and of probable environmental consequences. In the latter instance, resources and areas affected, and short-term impact characteristics are identified The possibility of modifying these impacts is also required. The effectiveness of these statements has been hindered by the difficulty in quantifying environmental impacts and in integrating the statements in the planning process. Agencies have often recognized these problems and are continuing attempts to rectify them. (See also W74-06107) (Schroeder-Wisconsin)
W74-06108

CEQ - A VIEW FROM THE TOP,
Council on Environmental Quality, Washington, D.C.
B. P. Jenny.
In: How Effective are Environmental Impact Statements, Oregon State Univ., Corvallis, Water Resources Research Institute Seminar WR 017.73, July 1973, p 11-18.

Descriptors: *Decision making, *Environmental control, Legislation, Federal government, Project planning, Alternate planning.
Identifiers: *Council on Environmental Quality, National Environmental Policy Act, Environmental impact statements.

The 1969 National Environmental Policy Act (NEPA) requires agencies to prepare and circulate an analysis of the environmental impacts of projects constructed by federal agencies, funded by federal grants or under federal regulation. The decision to submit the statements rests entirely with the agency, although growing case law has limited this discretion. The Council of Environmental Quality (CEQ), also established by the Act, has limited power over these statements. While the Act requires submission of the statement to the Council, it cannot demand preparation of the

statement or order changes in the agency's proposed action. The limited size of the CEQ staff also makes it virtually impossible for the Council to examine any particular project in detail. The Council has confined itself to preparation of procedures to implement the NEPA and in aiding agencies to conform to the Act. It has identified recurring problems requiring administrative or legislative reform, including the degree of integration of the statement into the planning process, inclusion of opposing views, and the adequacy of the assessment of alternative actions. The Council's role is best described as conciliatory, attempting to persuade agencies to implement not only the provisions but also the spirit of the NEPA. (See also W74-06107) (Schroeder-Wisconsin)
W74-06109

EPA REVIEW OF THE EIS,
Environmental Protection Agency, Seattle, Wash.
W. D. Jaspers.
In: How Effective are Environmental Impact Statements, Oregon State Univ., Corvallis, Water Resources Research Institute Seminar WR 017.73, July 1973. p 15-18.

Descriptors: *Project planning, *Environmental control, *Decision making, Legislation, Federal government, Social aspects, Inter-agency cooperation.
Identifiers: *Environmental impact statements, *National environmental policy act.

The 1969 National Environmental Policy Act (NEPA) requires federal agencies to undertake a number of activities among the most publicized of which is the Environmental Impact Statement (EIS). The immediate question raised is whether projects have improved as a result of these statements. While the immediate reaction is 'very little,' it is important to realize that the statement is part of a planning process. It has been suggested that because of the statements, fewer unsound projects have been inaugurated. Additional elements of the EIS process include a required interdisciplinary approach and improved quantification of environmental effects. Agencies have created new staff positions to accomplish these ends, although implementation of new quantification methods has been limited. Increased interaction has also resulted as agencies aid state, local, and international bodies in preparing impact statements as well as soliciting their comments on the agencies' own actions. The agencies are also required to consider a variety of alternatives and their consequent environmental impacts in choosing an activity. While it is different to assess whether this is actually being done, it is obvious that NEPA and EIS have increased awareness and discussion of the environmental impacts of an agency's action, which considerably implements the NEPA's goals. (See also W74-06107) (Schroeder-Wisconsin)
W74-06110

ENVIRONMENTAL ASPECTS OF THE POWER INDUSTRY,
Portland General Electric Co., Oreg.
R. L. Kathren.
In: How Effective are Environmental Impact Statements. Oregon State Univ., Corvallis, Water Resources Research Institute Seminar WR 017.73, July 1973, p. 19-30. 2 fig, 18 ref.

Descriptors: *Nuclear powerplants, *Environmental effects, Decision making, Regulation, Administrative agencies, Thermal pollution, Radioactive wastes, Permits, Construction, Operations, Baseline studies, Cost-benefit analysis, Radioactivity.
Identifiers: *Environmental Impact Statements, Atomic Energy Commission, Environmental Reports.

There are 28 power reactors in the U.S. producing 2% of the total power generated; in three decades, reactors will produce over 20%. The Atomic Energy Commission has always required an evaluation of the environmental impacts from radiation. The 1969 National Environmental Policy Act (NEPA) and the Calvert Cliffs decision have expanded this concern to cover impacts from heat, chemicals, and evaporation. The examination of environmental impacts begins with an Environmental Report (ER), submitted by the applicant seeking a construction permit. A second report is required to obtain an operating license. These reports contain scientific data used to compare conditions with and without the reactor. A monitoring program is conducted to identify existing radiation sources and potential radiation recipients. The ER also evaluates alternative sites and their consequential effects. The ER and AEC's independent research provide data sources to prepare the Environmental Impact Statement. Much of this data can be found in the AEC's Safety Analysis. The resultant duplication provides an extensive albeit expensive revelation of possible environmental impacts of nuclear power plants. While the statement has been subject to widespread criticism it does reflect an attempt to comply with the spirit of the NEPA. (See also W74-06107) (Schroeder-Wisconsin)
W74-06111

THE BUREAU OF RECLAMATION AND RESOURCE DEVELOPMENT,
Bureau of Reclamation, Boise, Idaho.
J. R. Woodworth.
In: How Effective are Environmental Impact Statements., Oregon State Univ., Corvallis, Water Resources Research Institute Seminar WR 017.73, July 1973, p. 31-35.

Descriptors: *Project planning, *Environmental effects, Decision making, Environmental control.
Identifiers: *Environmental Impact Statements, National Environmental Policy Act, Bureau of Reclamation.

The 1969 National Environmental Policy Act and requisite Environmental Impact Statement (EIS) has affected the Bureau of Reclamation in a number of ways. While they have significantly affected the organization and philosophy of the Bureau, the statement has placed a demanding workload forcing its attention to the problem of environmental impacts. To handle this increase workload, an environmental staff was established in 1970-71 infusing the Bureau with affirmative environmental stances. The cost of an Environmental Impact Statement averages over $25,000 and takes over eight months preparation. The process of environmental review, statement preparation, and public review has a direct impact in modifying and/or cancelling a number of the Bureau's proposed projects. The environmental staff provides benefits in addition to the preparation of EIS. These include environmental education programs, environmental improvement programs for operating Bureau objects, and affirmative steps to include additional environmental programs in developing projects. While it is conceded that Environmental Impact Statements do not guarantee that environmental damage will not occur, they do provide public review to minimize adverse effects. (See also W74-06107) (Schroeder-Wisconsin)
W74-06112

ENVIRONMENTAL POLICIES OF THE CORPS OF ENGINEERS,
Corps of Engineers, Portland, Oreg. North Pacific Div.
N. E. Saling, Jr.
In: How Effective are Environmental Impact Statements., Oregon State Univ., Water Resources Research Institute Seminar WR 017.73, July 1973, p 37-47.

Descriptors: *Environmental effects, *Project planning, *Decision making, Regional development, Water resources development, Inter-agency cooperation, Social participation, Social values, Legal aspects.
Identifiers: *Environmental Impact Statements, National Environmental Policy Act, Environmental assessment procedure.

In 1972, the Corps of Engineers implemented an eleven step procedure for assessing the environmental impact of alternative project designs by projecting an environmental profile over time for each design. Feedback was solicited from various sources, including public meetings, before a final recommendation and statement of findings was made. Environmental Impact Statements also provide information to the public about the impact of selected alternatives. The requirements for an adequate statement, however, have continued to change resulting in a transition from a brief report to a voluminous statement generating high costs in time and money. Because statements must be made for projects from those just initiated to those nearing completion, a tremendous backlog of work has been created. The impact statement is effective in informing the public and increasing their awareness. As a decision device, however, it is less successful because unlike the public meeting in the assessment process, the statment is less able to create a climate of accommodation. It seems, therefore, that the Corps existing assessment procedure best encompasses the spirit of the National Environmental Policy Act. (See also W74-06107) (Schroeder-Wisconsin)
W74-06113

HIGHWAYS AND ENVIRONMENT,
Oregon State Highway Div., Salem. Environmental Section.
J. B. Kennedy.
In: How Effective are Environmental Impact Statements., Oregon State Univ., Corvallis, Water Resources Research Institute Seminar WR 017.73, July 1973, p 49-59. 4 fig, 2 ref.

Descriptors: *Environmental effects, *Highways, *Project planning, Social impact, Social participation, Decision making, *Oregon, Regions.
Identifiers: *Environmental Impact Statements, Oregon Highway Division, National Environmental Policy Act, Action Plan.

The effects of recently required Environmental Impact Statements in the development of programs and policies by the Oregon State Highway Division is examined. The most obvious result has been an increased workload occasioned by the preparation of the statements. To accomplish this task, a separate Environmental Section was created, composed of an environmental coordinator, an air quality engineer, and a highway ecologist. The large volume of statements has limited the section's activities to their preparation. Utilization of highway personnel in a regional approach may allow a speed-up in the preparation of impact statements and greater integration of environmental concerns into the planning process. The highway division has proposed dividing the state into five regions according to physical, sociological, and economic similarities and assigning a Regional Environmentalist to each. His duties would include information gathering and dissemination to the public, environmental monitoring, and creation and maintenance of a regional data center collecting physical, land use, social, economic, and transportation data over time. The readily available data would enable more comprehensive public discussion and prompt incorporation of environmental effects into the planning process. (See also W74-06107) (Schroeder-Wisconsin)
W74-06114

TOMORROW'S ENVIRONMENTAL BENEFIT-COST ANALYSIS,
Battelle-Pacific Northwest Labs., Richland, Wash.
J. B. Burnham.
In: How Effective are Environmental Impact Statements., Oregon State Univ., Corvallis, Water

Resources Research Institute Seminar WR 017.73, July 1973, p 61-73. 2 fig, 3 tab, 10 ref.

Descriptors: *Environmental effects, *Cost-benefit analysis, *Nuclear powerplants, Social values, Decision making, Aesthetics, Measurement, Risks, Analytical techniques, Welfare(Economics), Economics, Land use, Optimum development plans.
Identifiers: *Environmental Impact Statements, *Criteria quantification, *Risk analysis.

Environmental Impact Statements give little guidance in selection and quantification of impacts and in the selection of a best alternative plan. At Battelle-Northwest, studies are being conducted of the societal valuation of environmental impacts in an attempt to provide additional data to decision makers. Eight impact criteria covering aesthetics, land use, health and safety, cultural, economic, water, air, and ecology are identified and dimension-less indices created for each. A norm is also created using preexisting conditions for comparison. Social phsychologists at at Battelle have been instrumental in attempts to develop societal value measures for each criterion. Efforts have been centered on the perfection of survey methods which best outline these criteria to the public and solicit their responses. From this survey, societal weights will be developed. The weights multiplied by the criteria indices provide decision makers with a composite measure useful in choosing the best alternative. In addition to the above criteria, the public should be allowed to value the risks involved with each alternative. A benefit/risk ratio is explained as a method of choosing among projects with potentials of societal risks. (See also W74-06107) (Schroeder-Wisconsin)
W74-06115

A FRAMEWORK FOR LOCAL PARTICIPATION AND DECISION-MAKING,
Oregon State Univ., Corvallis. Cooperative Extension Service.
J. R. Pease.
In: How Effective are Environmental Impact Statements., Oregon State Univ., Corvallis, Water Resources Research Institute Seminar WR 017.73, July 1973, p 75-85. 3 fig.

Descriptors: *Environmental effects, Social participation, Inter-agency cooperation, Decision making, Social values, *Oregon, *Local governments.
Identifiers: *Environmental Impact Statements, Evaluation criteria, Process model.

The Local Government Relations Division of Oregon and the University Extension Service have joined to devise a procedure to aid local communities in complying with existing and anticipated Environmental Impact Statement requirements, in an attempt to improve the quality of the statements and increase citizen participation in environmental decision-making. The existing impact statement process fails to define the environmental criteria to be measured. It also provides little indication of how to choose between alternative plans having differing environmental impacts or increase citizen participation. A three stage process is suggested to refine and improve existing tools used in the development of Environmental Impact Statements. The key to the process is increased local participation and improved data collection. Public participation is encouraged through the use of an ad hoc advisory committee composed of representatives from the planning commission, appropriate state and federal agencies, and interested citizens, having continuous input into the planning process. Open forums are also provided at planned intervals to alert the public to the impact of the proposed project. An Extension assessment staff will be developed to collect data and aid in environmental assessment. This increased information and participation should go far in improving the existing ills in the statement preparation process. (See also W74-06107) (Schroeder-Wisconsin)
W74-06116

BUFFALO HARBOR, NEW YORK (MAINTENANCE), (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District. Buffalo, N.Y.
For primary bibliographic entry see Field 8A.
W74-06197

RUCKER V. WILLIS (SUIT TO ENJOIN CONSTRUCTION).
For primary bibliographic entry see Field 6E.
W74-06230

7. RESOURCES DATA

7A. Network Design

A COMPUTER-BASED TELECONTROL AND COMMUNICATIONS SYSTEM FOR A WATER SUPPLY NETWORK,
For primary bibliographic entry see Field 7C.
W74-06146

SUPPORT IN THE OVERALL DESIGN DEVELOPMENT OF A NATIONAL WATER DATA EXCHANGE (NAWDEX), EXECUTIVE SUMMARY,
PRC Systems Sciences Co., McLean, Va.
For primary bibliographic entry see Field 7C.
W74-06350

7B. Data Acquition

ON MULTIDISCIPLINARY RESEARCH ON THE APPLICATION OF REMOTE SENSING TO WATER RESOURCES PROBLEMS,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
J. L. Clapp.
Available from NTIS, Springfield, Va 22151 N73-13378 Price $3.00 printed copy; $1.45 microfiche. Progress Report to NASA, 1972. 82 p. NASA Grant NGL 50-002-127.

Descriptors: *Remote sensing, *Water resources, *Monitoring, Water pollution, Mixing, *Path of pollutants, Water circulation, Currents(Water), Ecology.

The need for applying remote sensing techniques to develop a monitoring system is present in almost all aspects of water resources problems. This particularly holds true for water pollution monitoring, effluent mixing zone modeling, current and circulation modeling, determination of hydrologically active source areas, and aquatic ecosystems analysis. (Knapp-USGS)
W74-05988

PERMAFROST: RELATION BETWEEN ICE CONTENT AND DIELECTRIC LOSSES AT 100 DEG K,
California Univ., Berkeley. Dept. of Geosciences.
For primary bibliographic entry see Field 2C.
W74-05994

A HIGH SPEED MICROPROGRAMMED SYSTEM FOR GENERATION AND ACQUISITION OF SIGNALS,
Yale Univ., New Haven, Conn. Becton Center.
J. G. Zornig, and J. F. McDonald.
The Review of Scientific Instruments, Vol 44, No 9, p 1217-1221, September 1973. 7 fig, 2 append.

Descriptors: *Computers, *Data processing, *Data storage and retrieval, Design criteria, Computer programs.
Identifiers: Analog-to-digital converters.

A high speed microprogrammed system has been constructed to perform the synthesis and recording of high frequency nonrepeating pulse signals. The system can drive an analog device with arbitrarily designed waveforms and record individual pulses from several sensors in return. The present design operates at frequencies up to 1.5 MHz and can accept pulse durations of up to 1600 samples. Accuracy is limited by the available ADC and computer word size and is presently 8 bits (0.3 percent). A primary advantage of the design is the reliance to the maximum extent on the hardware of a small general purpose computer. Very little more external hardware is required than the ADC, DAC, and multiplexer. Waveforms are read directly from and stored directly in the host computer core memory. This enables the maximum flexibility in the design of service programs for particular experiments. At present the system is used for an experiment in which a fast pulse input is to be adjusted adaptively in real time based on the measured outputs of a system. (Little-Battelle)
W74-06021

A CALIBRATION OF INSTRUMENTS WITH NON-RANDOM ERRORS,
Bath Univ. (England); and South Western Industrial Research Ltd., Bath (England).
M. P. G. Pepper.
Technometrices, Vol 15, No 3, p 587-599, August 1973. 1 fig, 2 tab, 13 ref.

Descriptors: *Calibrations, *Measurement, *Mathematical models, *Instrumentation, Estimating.
Identifiers: *Errors, On-line calibration, Autocorrelated errors.

Problems of instrument calibration are considered using a mathematical model which represents the measurement error as the sum of random walk and an independent observational error. The model is demonstrated by application to on-line and on-stream calibrations and repetitive calibration schemes in which there are M-1 different sample sources. (Little-Battelle)
W74-06026

A PORTABLE WIRE-SPEED INDICATOR FOR USE WITH PLANKTON NETS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
L. D. Lusz, and K. D. Waldron.
Journal of the Fisheries Research Board of Canada, Vol 30, No 11, p 1749-1751, November 1973. 2 fig.

Descriptors: *Plankton nets, *Design criteria, Sampling, Velocity, Instrumentation, Monitoring.
Identifiers: *Wire speed indicators.

A wire-speed indicator for monitoring the rate of wire payout or retrieval during plankton tows consists of a metering wheel, a tachometer-generator, and a readout meter. The tachometer-generator is driven by the metering wheel and produces output which is fed to the readout meter. The unit is self-contained, provides remote readout, and measures wire travel up to 50 m/min. It has been used satisfactorily during about 100 tows. (Little-Battelle)
W74-06059

A SIMPLIFIED FLOW-SPLITTING CHAMBER AND SIPHON FOR PROPORTIONAL DILUTERS,
National Water Quality Lab., Duluth, Minn.
D. A. Benoit, and F. A. Puglisi.
Water Research, Vol. 7, No 12, p 1915-1916, December 1973. 1 fig, 1 ref.

Descriptors: *Bioassay, *Instrumentation, Laboratory equipment, Research equipment, Fry, Mature growth stage, Juvenile growth stage, Fish.

Identifiers: *Dosing apparatus, *Chambers(Flow-splitting), *Siphons(Flow-splitting), *Diluters(Proportional).

Simplified flow-splitting chambers and siphons were designed and tested for use with proportional diluters in bioassay systems. The apparatus allows each concentration from the diluter to be thoroughly mixed and divided four ways for delivery to duplicate fry and adult exposure tanks. Test water delivered to each exposure tank varied by only 5-10 percent of the calculated volumes. (Holoman-Battelle)
W74-06094

GLASS ELECTRODE RESPONSES INTERPRETED BY THE SOLID STATE HOMOGENEOUS- AND HETEROGENEOUS-SITE MEMBRANE POTENTIAL THEORY,
North Carolina Univ., Chapel Hill. William R. Kenan, Jr. Lab. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-06095

STEPPER MOTORS RESPOND TO DIRECT DIGITAL COMMAND,
S. J. Bailey.
Control Engineering, Vol 21, No 1, p 46-49, January 1974. 8 fig, 2 tab.

Descriptors: Properties, *Design data, *Specifications, Control, Instrumentation, Mechanical properties.
Identifiers: *Digital controls, *Stepper motors, Performance evaluation.

A stepper motor is a direct digital motion control device that converts electrical pulses into proportionate mechanical response. The stepper motor hardware which is currently available is described (stepper characteristics and manufacturers). Included also are descriptions of how steppers work and are controlled; stepper terminology; and performance characteristics and applications of stepper motors. (Holoman-Battelle)
W74-06100

AUTOMATION OF DIRECT POTENTIOMETRY,
Department of the Environment, Burlington (Ontario). Centre for Inland Waters.
For primary bibliographic entry see Field 5A.
W74-06133

TESTING DIGITAL CONTROL SYSTEMS,
N. Andreiev.
Control Engineering, Vol 21, No 1, p 52-54, January 1974. 8 fig.

Descriptors: *Testing procedures, *Instrumentation, Equipment, Automatic control, Automation, Methodology.
Identifiers: *Pilot systems, *Digital control systems.

When the control engineer is faced with a problem of pilot system checkout, he should have certain basic tools to start with - a systematic approach and test instruments. This article presents a description of basic test instrumentation and an accepted testing procedure that consists of a gradual buildup of an operating system core by individually testing each subassembly. (Holoman-Battelle)
W74-06141

PROCESS CONTROLLERS: A CASE OF PNEUMATIC-ELECTRONIC COEXISTENCE,
S. J. Bailey.
Control Engineering, Vol 20, No 12, p 46-54, December 1973.

Descriptors: *Reviews, Instrumentation, Control, Economics, Equipment.
Identifiers: *Pneumatic controllers, *Electronic controllers, *Process controllers.

Electronic and pneumatic process controllers are reviewed by giving characteristics and advantages of various controllers in use in each of the categories. An argument is also given for the merits of electronic and pneumatic controllers in terms of their coexistence. (Holoman-Battelle)
W74-06143

RESPONSE TIME OF HIGH-FREQUENCY OSCILLATOR-TYPE PROXIMITY DETECTORS,
M. Uemura, and K. Ueda.
Control Engineering, Vol 20, No 12, p 56-58, December 1973. 5 fig.

Descriptors: Physical properties, *Instrumentation.
Identifiers: *Response time, *Proximity detectors, *High frequency oscillators, Response frequency.

The response time of a high frequency oscillator-type proximity detector is difficult to define because it depends on physical properties of the object to be detected, the size of the object, and the distance of the object from the sensing head. The discussion presented shows how to properly utilize the theory behind the operation of this particular type of proximity detector. (Holoman-Battelle)
W74-06144

A SIMPLE TURBIDIMETER FOR RAPID DETERMINATION OF LOW BACTERIA CONCENTRATIONS,
Consiglio Nazionale delle Ricerche, Naples (Italy). Laboratorio di Cibernetica.
For primary bibliographic entry see Field 5A.
W74-06147

AUTOMATIC RECORDING DILATOMETER,
Montreal Univ., (Quebec). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-06148

THE STANDARD POTENTIAL OF THE SINGLE-CRYSTAL COPPER ELECTRODE IN AQUEOUS SOLUTIONS,
Copenhagen Univ. (Denmark). H. C. Oersted Inst.
For primary bibliographic entry see Field 2K.
W74-06149

APPARATUS FOR CONTROL OF POISON CONCENTRATION IN TOXICITY STUDIES WITH FISH,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5C.
W74-06174

AUTOMATIC COLLECTION AND TRANSMISSION OF HYDROLOGICAL OBSERVATIONS.
World Meteorological Organization, Geneva(Switzerland).
Operational Hydrology Report No 2, (WMO No 337), 1973. 69 p, 10 fig, 18 ref, 2 append.

Descriptors: *Data collections, *Instrumentation, *Telemetry, *Hydrologic data, Automation, Data processing, Precipitation gages, Stream gages, Meteorological data.

The advantages and disadvantages of updating, modernizing and automating hydrologic data collection systems are discussed in the light of recent technological progress in automatic instrumentation and transmission systems. Detailed guidance is included concerning the choice of automatic instruments and types of installation for various climatic and geographical conditions. A description of basic systems of transmission of hydrological observations and guidance for their selection are followed by examples of operational automatic transmission systems for hydrologic purposes in various countries. Technical information on instruments of proven reliability is tabulated. (Knapp-USGS)
W74-06287

SNOW SURVEYS FROM EARTH SATELLITES--A TECHNICAL REVIEW OF METHODS.
World Meteorological Organization, Geneva (Switzerland).
Report No 19 (WMO No 353), 1973. 42 p, 13 fig, 2 tab, 30 ref, 3 append.

Descriptors: *Satellites(Artificial), *Remote sensing, *Snow surveys, Snow cover, Snowpacks, Aerial photography, Data collections, Data processing, *Reviews.

Background information on the satellite and sensor systems available for snow studies, and the various approaches or methods used by various countries, and the results obtained are described. The approaches used are grouped as follows: (1) direct optical-mechanical methods; (2) optical-electronic methods; and (3) automated-electronic methods. In nonmountainous terrain the accuracy in location of the snow line has been cited at plus or minus 20 km. Most verifying figures in mountainous areas are cited in terms of the elevation of the snow line. (Knapp-USGS)
W74-06295

PRELIMINARY DESIGN CRITERIA, PERFORMANCE AND LIMITATIONS OF AN AIRBORNE LASER BATHYMETRIC SYSTEM,
Sparcom, Inc., Alexandria, Va.
G. D. Hickman, and A. H. Ghovanlou.
Technical Report No 3, August 1973. 49 p, 21 fig, 7 tab, 3 ref. Contract N000-14-71C-0202.

Descriptors: *Remote sensing, *Bathymetry, Sounding, *Instrumentation, Depth, *Turbidity, Hydrography, *Design criteria, Measurement.
Identifiers: *Lasers.

Laboratory transmission and scattering measurements were made of a pulsed blue-green neon laser through waters of varying turbidity (0.07-2.0) to develop an empirical model for predicting the performance of an airborne laser bathymetric system. The maximum depth measuring capability was approximately 15 attenuation lengths for a laser system operating at 30 kw/peak pulse from an altitude of 500 meters. The optimum scan angle of the laser transmitter was approximately 20 deg while the scan rate for a laser pulsing at 100 pps was 0.8 seconds. (Knapp-USGS)
W74-06296

SURFACE OBSERVATIONS, GROUND TRUTH AND DATA, NASA-USGS MISSION 144, CHESAPEAKE BAY REGION, SEPT. 22-30, 1970,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5A.
W74-06300

TOWARD RADSCAT MEASUREMENTS OVER THE SEA AND THEIR INTERPRETATION,
Kansas Univ./Center for Research, Inc., Lawrence. Space Technology Center.
J. P. Claassen, A. K. Fung, S. T. Wu, and H. L. Chan.
Available from NTIS Springfield, Va. 22151 as NASA CR-2328 Price $4.25 domestic; $6.75 foreign. National Aeronautics and Space Administration Contractor Report CR-2328, November 1973. 114 p, 48 fig, 10 tab, 65 ref. NASA Contract NAS 1-10048.

Descriptors: *Remote sensing, *Microwaves, Radar, Oceanography, Meteorology,

Waves(Water), Winds, Data collections, Meteorological data.

Sub-orbital observations by a composite radiometer- scatterometer sensor (RADSCAT) demonstrate the remote anemometric capability of the sensor over sea through various weather conditions. The large-scale fluctuations of the wind over the sea dictate the observational coverage required to correlate measurements with the mean surface wind speed. Various theoretical investigations were performed to establish a premise for the joint interpretation of the experiment data. The effects of clouds and rains on downward radiometric observations over the sea were computed. From this study a method of predicting atmospheric attenuation from joint observations was developed, and the emission and scattering characteristics of the sea were derived. (Knapp-USGS)
W74-06361

ERTS-1 APPLICATIONS IN HYDROLOGY AND WATER RESOURCES,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
V. V. Salomonson, and A. Rango.
Journal of the American Water Works Association, Vol 66, No 3, p 168-172, March 1974. 6 fig, 25 ref.

Descriptors: *Data collections, *Satellites(Artificial), *Remote sensing, Monitoring, Mapping, Water resources, Hydrologic data, Snow cover, Floods, Glaciers, Terrain analysis, Telemetry.

After having been in orbit for less than one year, the Earth Resources Technology Satellite (ERTS-1) has shown that it provides applicable data for more effective monitoring and management of surface-water features over the globe. In addition the Data Collection System (DCS) is a reliable tool for gathering hydrologic data from remote regions. The data are applicable in the monitoring and mapping of physiography and land use in drainage basins, surface-water bodies including wetlands, snow cover, flood-inundated areas, and glaciers. In-situ information is also being collected and relayed via satellite to water-resources-management agencies. (Knapp-USGS)
W74-06362

APPLICATION OF MULTISPECTRAL REMOTE SENSING TO SOIL SURVEY RESEARCH IN SOUTHEASTERN PENNSYLVANIA,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
H. L. Mathews, R. L. Cunningham, J. E. Cipra, and T. R. West.
Soil Sci Soc Am Proc. Vol 37, No 1, p 88-93. 1973. Illus.
Identifiers: *Computer analyses, Display, Limestone, Mapping, *Maps, *Pennsylvania, Remote sensing, Shale, *Soil survey, Southeastern, Spectral imagery.

Computer analyses of multispectral imagery collected from aircraft shows promise for reducing preparation time and increasing the accuracy of soil survey maps. The study area in southeastern Pennsylvania included soils formed from limestone, shale, sandstone, alluvium and local colluvium. Four study sites 8.5-30 ha in size were selected from a 72 km flightline. Surface reflectance properties of nonvegetated fields were classified using pattern recognition techniques. Computer printout maps showing areal distribution of soil spectral classes were compared with field conditions. Limestone, shale, sandstone, and local colluvial soils were separated with a high degree of accuracy. Erosion classes separated by spectral maps were comparable in location and extent to field observations. The feasibility of preparing computer display maps for potential use as soil mapping aids was demonstrated.--Copyright 1973, Biological Abstracts, Inc.
W74-06494

7C. Evaluation, Processing and Publication

LAKE ERIE, OHIO, PENNSYLVANIA, NEW YORK INTAKE WATER QUALITY SUMMARY, 1970.
Environmental Protection Agency, Chicago, Ill. Region V.
For primary bibliographic entry see Field 5B.
W74-05987

MULTIVARIATE APPROACHES TO ALGAL STRATAGEMS AND TACTICS IN SYSTEMS ANALYSIS OF PHYTOPLANKTON,
Wisconsin Univ., Madison. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W74-06047

INTERNATIONAL COOPERATIVE STUDY OF ORGANOCHLORINE AND MERCURY RESIDUES IN WILDLIFE, 1969-71,
Freshwater Fisheries Lab., Pitlochry (Scotland).
For primary bibliographic entry see Field 5A.
W74-06053

PESTICIDES IN SELECTED WESTERN STREAMS - 1968-71,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 5A.
W74-06062

PROGRAMMABLE TEMPERATURE CONTROLLERS,
Indian Inst. of Tech., Bombay.
V. V. Athani, and D. B. Phatak.
Instruments and Control Systems, Vol 47, No 1, p 48-50, January 1974. 4 fig, 1 tab, 7 ref.

Descriptors: *Instrumentation, *Fabrication, *Testing procedures, *Design, *Temperature control, Regulation, Computer programs.
Identifiers: Programmable temperature controllers.

Temperature programming and controlling units have been fabricated as two independent units. All solid state circuitry and printed circuit boards have been carried out on the individual circuits as well as on the assemblies of the temperature programming and controlling units. The device was found appropriate for both linear temperature variations using the internal program generator and temperature cycling using the external programming unit. (Holoman-Battelle)
W74-06145

A COMPUTER-BASED TELECONTROL AND COMMUNICATIONS SYSTEM FOR A WATER SUPPLY NETWORK,
R. H. Burch, K. C. Marlow, G. S. Gibbs, and M. S. Jennions.
Water and Water Engineering, Vol 77, No 933, p 453-458, November 1973. 8 fig, 2 tab.

Descriptors: *Water supply, *Monitoring, *Telemetry, *Network design, *Data transmission, *Radio communication systems, Control systems, Digital computers, Networks, Data processing, Equipment, Water quality.
Identifiers: Minicomputers.

Presented are aspects of telemetric operations utilized by a water supply network in England. The telemetry and control system is based on the concept of a central master station which scans plant data from the remote outstations by means of time division multiplexing (TDM). Each input and output connected to the system is given a unique numerical address so that data from any point can be requested by the transmission of a binary-coded function-address word. All the outstations receive the request, but only the outstation that recognizes the address replies with a word, or several words of data corresponding to the selected analogue or digital inputs. The system operates, therefore, in the half-duplex mode. Remote controls are performed by interrupting the scanning sequence with coded control messages, and a system of revertive checking is used to provide maximum security. Communication is, in most cases, over UHF radio links. The master station radio scanner is permanently on, but the outstation radios are only keyed when data is requested. The basic word length for both request and reply words is 12 bits, chosen to provide compatibility with the digital computer, adequate capacity for addressing and sufficient resolution for digitized analogue values. The operation of the master station is normally controlled by a minicomputer having 12,288 words of 12-bit core storage and a 32,768 word fixed-head disc store. An operator's control panel and addressable K-cards for local plant inputs and outputs are connected to the computer via standard interfacing units. The telemetry master unit is directed by the computer but is able to carry on scanning inputs set up on a patch panel in the event of computer failure. (Holoman-Battelle)
W74-06146

'CONTROL BY VARIANCE' WITH THE PROBABILITY COMPUTER,
Anacon, Inc., Ashland, Mass.
R. M. Green, and G. E. Stackhouse.
Control Engineering, Vol 21, No 1, p 50-51, January 1974. 3 fig, 2 ref.

Descriptors: *Control, Instrumentation, Probability, Automatic control.
Identifiers: *Probability computers, *Process variables, Variance, Probability density, Limits.

The probability computer predicts the likelihood of a process variable exceeding its limit value. The probability computer uses its predictions to move the setpoint away from the limit value when the variable 'acts up.' The prabability computer can benefit from observing the departures of the variable from the time average (mean). Such departures afford the probability computer data with which to calculate variance which is a measure of how often and how far the variable strays beyond its limit value. From the variance, the probability computer computes P(X greater than or equal to Y), the probability that the variable X will exceed its limit value Y. The probability density curve of X is standard except for concentration on one side of the mean (time average) for the purpose of computing P(X greater than or equal to Y). Operation of the probability computer was checked by applying a signal from a process simulator. A series of sine waves of varying frequency and amplitude provided the process variable simulation for the computer to monitor. (Holoman-Battelle)
W74-06152

GEOPHYSICAL INVESTIGATIONS OF WASHINGTON'S GROUND WATER RESOURCES,
Washington State Univ., Pullman. Coll. of Engineering.
For primary bibliographic entry see Field 2F.
W74-06262

GEOLOGY AND WATER RESOURCES OF EASTERN PART OF JUDITH BASIN, MONTANA,
Geological Survey, Billings, Mont.
For primary bibliographic entry see Field 2F.
W74-06263

LAKES OF OREGON: VOLUME ONE, CLATSOP, COLUMBIA, AND TILLAMOOK COUNTIES,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 2H.
W74-06270

MAGNITUDE AND FREQUENCY OF FLOODS IN ILLINOIS,
Geological Survey, Champaign, Ill.
For primary bibliographic entry see Field 2E.
W74-06271

FLOOD PRONE AREAS IN THE SAN FRANCISCO BAY REGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. T. Limerinos, K. W. Lee, and P. E. Lugo.
Water Resources Investigation 37-73 (Open-file report), 1973. 3 sheets, 3 map, 12 ref.

Descriptors: *Floods, *California, *Mapping, Flood plains, Flood forecasting, Tides, Planning.
Identifiers: *Flood mapping, *Flood-prone areas, *San Francisco(Calif).

Areas in the nine-county San Francisco Bay region that are subject to inundation by the 100-year flood are delineated on maps. In general, the flood plains studied include only those along streams whose watersheds are greater than 2 square miles. Areas contiguous to the ocean and bay that have a potential flood hazard associated with high tides are delineated with respect to the 100-year high tide. The maps are intended only to provide information for regional planning aimed at the judicious use or management of flood-plain lands, and to indicate areas of potential flood hazard. (Knapp-USGS)
W74-06275

INDEX OF SURFACE WATER STATIONS IN TEXAS, OCTOBER 1973.
Geological Survey, Austin, Tex.
Open-file report, October 1973. 24 p, 2 plate, 2 tab.

Descriptors: *Data collections, *Hydrologic data, *Gaging stations, *Texas, Stream gages, Sampling, Stage-discharge relations, Streamflow, Surface waters, Water quality, Floods, Reservoirs.

The U.S. Geological Survey's investigations of the water resources of Texas Water Development Board, Texas are conducted in cooperation with the Texas Highway Department, river authorities, cities, U.S. Corps of Engineers, Environmental Protection Agency, U.S. Soil Conservation Service, and others. This index shows the station number and name, type of record collected, and the office at which the basic data are permanently filed. A permanent numerical designation for gaging stations has been adopted on a nationwide basis; stations are numbered and listed in downstream order. As of October 1, 1973, 463 stream-gaging, 77 reservoir-content, 14 stage, 8 flood-profile partial-record, 98 low-flow partial record, 187 crest-stage partial-record, 35 tide-level, 11 periodic water-quality, 110 daily chemical-quality, 25 continuous-recording water-quality, 71 periodic chemical-quality, 127 periodic organic-quality, 83 pesticides, 9 sediment, 27 periodic sediment, 34 periodic biological, and 55 reservoir-inventory stations were in operation. In addition to streamflow information collected at the regular gaging stations and the partial-record stations, measurements of flow and water-quality data have been collected for specific purposes at various other locations in the State. Many of these measurements show the peak discharges for the greatest flood that has been known to occur at that site. Others show minimum flows or channel losses experienced in various stream reaches. (Knapp-USGS)
W74-06279

A COMPUTER PROGRAM FOR EARTHQUAKE ANALYSIS OF GRAVITY DAMS INCLUDING HYDRODYNAMIC INTERACTION,
California Univ., Berkeley. Earthquake Engineering Research Center.
For primary bibliographic entry see Field 8A.
W74-06280

AUTOMATIC COLLECTION AND TRANSMISSION OF HYDROLOGICAL OBSERVATIONS.
World Meteorological Organization, Geneva(Switzerland).
For primary bibliographic entry see Field 7B.
W74-06287

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE DALLAS, TEXAS METROPOLITAN AREA, 1971,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2A.
W74-06288

NUMERICAL SIMULATION OF TSUNAMIS,
Hawaii Inst. of Geophysics, Honolulu.
For primary bibliographic entry see Field 4A.
W74-06297

STANDARDIZATION IN HYDROLOGY AND RELATED FIELDS.
World Meteorological Organization, Geneva (Switzerland).
Report No 18 (WMO No 351), 1973. 21 p, 12 ref.

Descriptors: *Hydrologic data, *Data collections, *Hydrology, *Standards, *International commissions, International Hydrological Decade.

Reasons are presented for the establishment in the World Meteorological Organization of the Inter-Agency Panel on Standardization of Instruments, Methods and Techniques in Hydrology. Information is also presented on the levels of standards, and the processes of standardization. The difficulties involved in standardization in hydrology and related fields are discussed. Current standardization activities of each of the international organizations participating in the Panel are described. (Knapp-USGS)
W74-06298

SUPPORT IN THE OVERALL DESIGN DEVELOPMENT OF A NATIONAL WATER DATA EXCHANGE (NAWDEX), EXECUTIVE SUMMARY,
PRC Systems Sciences Co., McLean, Va.
F. D. Mason.
Report R-1697, January 8, 1974. 14 p, 2 fig. USGS Contract 14-08-0001-13499.

Descriptors: *Data collections, *Information exchange, *Information retrieval, *Data storage and retrieval, *Hydrologic data, Data processing, Basic data collections.
Identifiers: National Water Data Exchange(NAWDEX).

Overall design development of a national water data exchange (NAWDEX) is described. A system design for NAWDEX was prepared based on previous efforts of the U. S. Geological Survey, internal expertise in water data systems, and the results of a national survey of the water data community. An implementation plan was also prepared which can be used to transform the recommended design into an operating entity. The NAWDEX design includes an organizational structure featuring a System Central with overall management responsibility linking together participants from throughout the water data community. Operationally, Systems Central would provide an index to water data and certain limited data services with the bulk of the actual data exchange being effected by member agencies. Nominal charges for data requests and services are recommended as is federal funding of all fiscal and routine operating costs. (Knapp-USGS)
W74-06350

TOWARD RADSCAT MEASUREMENTS OVER THE SEA AND THEIR INTERPRETATION,
Kansas Univ./Center for Research, Inc., Lawrence. Space Technology Center.
For primary bibliographic entry see Field 7B.
W74-06361

ERTS-1 APPLICATIONS IN HYDROLOGY AND WATER RESOURCES,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W74-06362

SUMMARY OF WATER-LEVEL AND PUMPAGE DATA IN THE CHEYENNE AND FEDERAL MUNICIPAL WELL FIELDS, APRIL 1, 1972 TO APRIL 2, 1973, CHEYENNE, WYOMING,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4B.
W74-06369

NATIONAL WEATHER SERVICE RIVER FORECAST SYSTEM--SNOW ACCUMULATION AND ABLATION MODEL,
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 2C.
W74-06370

THE WATER-STAGES AT THE COASTS OF SWEDEN, 1970.
Swedish Meteorological and Hydrological Inst., Stockholm.
For primary bibliographic entry see Field 2E.
W74-06373

WATER QUALITY REPORT, UPPER SNOQUALMIE RIVER SYSTEM, AUGUST 1972-NOVEMBER 1972,
Washington State Dept. of Ecology, Olympia.
For primary bibliographic entry see Field 5B.
W74-06375

GEOHYDROLOGY OF ATCHISON COUNTY, NORTHEASTERN KANSAS,
Geological Survey, Washington, D.C.
J. R. Ward.
For sale by U.S. Geological Survey, Washington, D.C. 20242. Price $1.25 per set. Hydrologic Investigations Atlas HA-467, 1973. 2 sheets, 1 tab, 13 ref.

Descriptors: *Hydrogeology, *Kansas, Groundwater, Water quality, Aquifer characteristics, *Hydrologic data, *Maps, Glacial drift.
Identifiers: *Atchison County(Kans).

Information is presented on the groundwater resources of Atchison County, Kansas. Bedrock of Late Pennsylvanian age is exposed throughout the county. Unconsolidated glacial drift, loess, deposits beneath terraces, and alluvium overlie the bedrock surface. Both topography and texture of the glacial drift exert a strong influence on recharge to and discharge from the aquifers. Discharge from the aquifers is primarily to streams that drain the county. Some discharge occurs from seeps and springs along valley walls and from wells. A few wells in the county flow continuously. The unconsolidated Pleistocene deposits are the best potential sources of groundwater in the county. The most favorable areas overlie buried valleys. Four areas exist where water flows at the surface due to artesian pressure. Wells are

completed in bedrock, glacial drift, and alluvial aquifers. A summary of the concentrations of selected dissolved mineral constituents is shown on the correlation of stratigraphy and water quality diagram. Most of the water is of the calcium bicarbonate type. Although hard, it generally can be softened by simple treatment. Dissolved-solids concentrations are generally high, but acceptable. The highest concentrations of dissolved solids are in water from thick glacial deposits. (Knapp-USGS)
W74-06376

MEAN PRECIPITATION-HOURS FOR THE CONTERMINOUS UNITED STATES,
Forest Service (USDA), St. Paul, Minn. North Central Forest Experiment Station.
For primary bibliographic entry see Field 2B.
W74-06390

MAPPING OF SUSPENDED-SEDIMENT DISCHARGE IN COMPLEX ATLASES (KARTOGRAFIROVANIYE STOKA VZVESHENNYKH NANOSOV V KOMPLEKSNYKH ATLASAKH),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 2J.
W74-06452

8. ENGINEERING WORKS

8A. Structures

BURNT CREEK RC AND D MEASURE FOR FLOOD PREVENTION (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Bismarck, N. Dak.
For primary bibliographic entry see Field 4A.
W74-06002

CIBOLO PROJECT, TEXAS.
For primary bibliographic entry see Field 6E.
W74-06004

WATER RESOURCES DEVELOPMENT--1973.
For primary bibliographic entry see Field 6E.
W74-06007

OFFSHORE MARINE ENVIRONMENT PROTECTION ACT OF 1973, FIRST SESSION ON S.80.
For primary bibliographic entry see Field 6E.
W74-06009

BUFFALO HARBOR, NEW YORK (MAINTENANCE), (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District. Buffalo, N.Y.
Avail. from Nat. Tech. Info. Serv., Springfield, Va. 22151, as EIS-NY-73-0100-F, for $3.00 paper copy, $1.45 microfiche. May 26, 1972. 34 p, 2 map.

Descriptors: *New York, *Harbors, *Lake Erie, *Breakwaters, Channels, Dredging, Maintenance, Piers, Pollutants, Channelization, Environmental effects, Trubidity.
Identifiers: *Environmental Impact Statements.

The work under consideration is the recurring maintenance of completed channels and structures in the deep-draft navigation project for Buffalo Harbor, New York. Project features are depicted on a map. They include a breakwater system, a pier, and dredged areas in entrance channels. Maintenance consists of dredging as necessary to maintain authorized depths, and of repairs to structures. Environmental impacts include dredging of 525,000 cubic yards of sediment annually, about one-third being placed in an inclosed disposal area and the less polluted remainder in Lake Erie. Adverse environmental effects include temporary turbidity in dredging and open-water spoil areas and addition to Lake Erie of pollutants contained in dredged material. Alternatives include discontinuance of maintenance and provision of inclosed areas for all spoil. (Sears-Florida)
W74-06197

A COMPUTER PROGRAM FOR EARTHQUAKE ANALYSIS OF GRAVITY DAMS INCLUDING HYDRODYNAMIC INTERACTION,
California Univ., Berkeley. Earthquake Engineering Research Center.
P. Chakrabarti, and A. K. Chopra.
Available from NTIS Springfield, Va 22151 AD-766 271 Price $3.00 printed copy; $1.45 microfiche. Report No 73-7, May 1973. 56 p, 8 fig, 14 ref, append. Army Contract DACW73-71-C-0051.

Descriptors: *Earthquakes, *Dams, *Computer programs, *Simulation analysis, Finite element analysis, Earthquake engineering, Seismic design, *Gravity dams.

A computer program for earthquake analysis of gravity dams includes effects of hydrodynamic interaction. The dam-water system is idealized as two-dimensional in geometry, the material behavior is assumed to be linearly elastic, and the transverse horizontal as well as the vertical component of ground motion are considered. The dam is represented as a finite element system, whereas water in the reservoir is treated as a continuum of infinite length in the upstream direction, governed by the wave equation. Compressibility of water is considered; this results in governing equations for the dam depending on the excitation frequency. The analysis is performed in the frequency domain, by first obtaining the frequency responses and then using a Fourier synthesis. A listing of the computer program is included and the usage and capabilities are illustrated. (Knapp-USGS)
W74-06280

EARTHQUAKE RESPONSE OF GRAVITY DAMS INCLUDING RESERVOIR INTERACTION EFFECTS,
California Univ., Berkeley. Earthquake Engineering Research Center.
P. Chakrabarti, and A. K. Chopra.
Available from NTIS, Springfield, Va. 22151 as AD-762 330 Price $6.00 printed copy; $1.45 microfiche. Report No EERC 72-6, December 1972. 164 p, 53 fig, 4 tab, 38 ref.

Descriptors: *Gravity dams, *Earthquakes, *Earthquake engineering, *Seismic design, *Dam design, *Earth dams, Mathematical models, Dam failure, Finite element analysis, Seiches, Waves(Water).

A procedure was developed for earthquake analysis of gravity dams including effects of reservoir interaction. The analysis includes the influence of the reservoir on the response of the structure. The problem of transverse vibration of a monolith of the dam is reduced to one in two dimensions. The material behavior is assumed to be linearly elastic. The dam is represented as a finite element system and the reservoir is treated as a continuum governed by the wave equation. The reservoir causes a significant increase in the resonant periods on the dam. This lengthening of the resonant periods depends upon the depth of the reservoir and the modulus of elasticity of the dam. It is negligible for reservoir depths less than approximately 40% of the dam height and increases with the modulus of elasticity of the dam. Analyses considering only the fundamental mode of vibration are capable of predicting reasonably accurately the maximum displacements of the dam with reservoir interaction. The presence of the reservoir causes a significant increase in the lateral displacement of the dam which is not always accompanied by an increase in the stresses in all parts of the dam. For typical California ground motions reservoir interaction causes increases in stresses in almost direct proportion to the additional displacements. The response of the dam alone to vertical components of ground motion is small relative to that due to the horizontal component of ground motion, but vertical response becomes very significant when reservoir interaction effects are included. For low height dams the response to the vertical component of ground motion may even exceed that due to the horizontal component. (Knapp-USGS)
W74-06359

8B. Hydraulics

MODEL AND PROTOTYPE ANALYSIS OF THE OLD RIVER DIVERSION ON THE MISSISSIPPI RIVER,
Army Engineer District. Vicksburg, Miss. Potamology Section.
P. C. Harris, and W. R. Posey.
Available from the National Technical Information Service as PB-230 433, $4.50 in paper copy, $1.45 in microfiche. Mississippi State University Water Resources Research Institute State College Publication, 1973. 22 p, 12 fig, 2 tab, 6 ref. OWRR A-999-MISS (9c).

Descriptors: *Hydraulic models, *Mississippi River, *River training, Sedimentation, Cutoffs, Dikes, *Diversion dams, *Control structures.
Identifiers: Atchafalaya River, Old River.

In order to prevent the capture of the Mississippi River by the Atchafalaya River, two control structures were built on the west bank of the Mississippi River approximately 10 miles upstream from Old River. A side draft developed at the entrance to the low sill control structure tending to pull tows toward the structure. A model of the reach was constructed at Waterways Experiment Station to develop a plan to improve the situation. The plan for improving the condition was to develop the pool along the left bank with the crossing near the entrance to the structure stabilizing the channel into its former alignment. The results of the model tests were that the dike field filled and the bar on the opposite side receded. By keeping the dike profiles low and sloping, scour around the dikes may be held to a minimum. This type of design allows the river to adjust slowly to a dike field rather than fight it. (Knapp-USGS)
W74-05961

STEADY-STATE PATTERNS OF RAINWATER SEEPING THROUGH BEDDED SOIL WITH AND WITHOUT TILE DRAINS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W74-06257

EFFECTS OF MEANDERING ON SEDIMENT DISCHARGES AND FRICTION FACTORS OF ALLUVIAL STREAMS,
Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
For primary bibliographic entry see Field 2J.
W74-06258

A COMPUTER PROGRAM FOR EARTHQUAKE ANALYSIS OF GRAVITY DAMS INCLUDING HYDRODYNAMIC INTERACTION,
California Univ., Berkeley. Earthquake Engineering Research Center.
For primary bibliographic entry see Field 8A.
W74-06280

HYDRAULICS AND SEDIMENTARY STABILITY OF COASTAL INLETS,
Florida Univ., Gainesville. Coastal and Oceanographic Engineering Lab.
M. P. O'Brien, and R. G. Dean.

Available from NTIS as COM 73-11916 for $3.75 in paper copy. In: Proceedings of 13th Conference on Coastal Engineering held Vancouver, B.C., Canada, July 10-14, 1972. ASCE, Chap 41, p 761-780, 1972. 14 fig, 13 ref.

Descriptors: *Inlets(Waterways), *Deposition, Hydraulics, Stability, Florida, New York.
Identifiers: Stability indices.

A method is presentd for investigating the stability of coastal inlets against closure due to transport and deposition of sand in the inlet cross-section. The method utilizes earlier contributions by: (1) Keulegan representing the hydraulics of inlets, (2) O'Brien which describes an equilibrium relationship between the cross-sectional area of the inlet and the bay tidal prism, and (3) Escoffier which relates to the stability of an inlet under changes in conditions which tend to close or enlarge an inlet. A 'stability index' is defined which incorporates the buffer storage area available in the inlet cross-section, prior to the onset of closure and also includes the capability of the inlet to transport excess sand from its cross-section. In order to apply the method, geometric and hydraulic data representing the inlet are necessary; the minimum data required include a survey of the inlet throat cross-section and the lag between high (or low) water in the ocean and the following slack water in the inlet. In addition, it is necessary to conduct measurements or make assumptions concerning the minor and gradual hydraulic loss coefficients. Based on assumed depositional patterns in the inlet, the method is applied to five real inlets and the stability indices are presented. (Sinha - OEIS)
W74-06321

8C. Hydraulic Machinery

PUBLIC WORKS FOR WATER AND POWER DEVELOPMENT AND ATOMIC ENERGY COMMISSION APPROPRIATION BILL, 1974 PART 3.
For primary bibliographic entry see Field 6E.
W74-06008

STEPPER MOTORS RESPOND TO DIRECT DIGITAL COMMAND,
For primary bibliographic entry see Field 7B.
W74-06100

TESTING DIGITAL CONTROL SYSTEMS,
For primary bibliographic entry see Field 7B.
W74-06141

PROCESS CONTROLLERS: A CASE OF PNEUMATIC-ELECTRONIC COEXISTENCE,
For primary bibliographic entry see Field 7B.
W74-06143

8D. Soil Mechanics

EARTHQUAKE RESPONSE OF GRAVITY DAMS INCLUDING RESERVOIR INTERACTION EFFECTS,
California Univ., Berkeley. Earthquake Engineering Research Center.
For primary bibliographic entry see Field 8A.
W74-06359

8I. Fisheries Engineering

REPRODUCTIVE CHARACTERISTICS OF THE CUI-UI LAKESUCKER (CHASMISTES CUJUS COPE) AND ITS SPAWNING BEHAVIOR IN PYRAMID LAKE, NEVADA,
Nevada Univ., Reno. Dept. of Biology.
For primary bibliographic entry see Field 2H.
W74-05999

INFLUENCE OF ENVIRONMENTAL EXPERIENCE ON RESPONSE OF YEARLING RAINBOW TROUT (SALMO GARIDNERI) TO A BLACK AND WHITE SUBSTRATE,
Guelph Univ. (Ontario). Coll. of Biological Science.
For primary bibliographic entry see Field 5C.
W74-06063

INFLUENCE OF APPEARANCE OF PREY AND SATIATION OF PREDATOR ON FOOD SELECTION BY NORTHERN PIKE (ESSOX LUCIUS),
Wisconsin Cooperative Fishery Unit, Stevens Point.
D. W. Coble.
J Fish Res Board Can. Vol 30, No 2, p 317-320, 1973.
Identifiers: Bluegill, Carassius-auratus, Carp, Cyprinus-carpio, Esox-lucius, Fathead minnows, Food, *Goldfish, Lepomis-cyanellus, Lepomis-macrochirus, *Pikes(Northern), Pimephales-promelas, *Predator-prey relationship, Sunfish.

Northern pike (E. lucius) were put in tanks with fantail and regular-tail goldfish (Carassius auratus) or with goldfish of different colors. Physical appearance of prey did not affect the pike's feeding. In experiments in plastic pools 4 spp. of fish were exposed to predation by northern pike that were satiated or deprived of food for either 2 or 4 wk. The pike always selected carp (Cyprinus carpio) and fathead minnow (Pimephales promelas) over green sunfish (Lepomis cyanellus) and bluegill (L. macrochirus).--Copyright 1973, Biological Abstracts, Inc.
W74-06102

EFFECTS OF STARVATION AND SUBSEQUENT FEEDING ON SURVIVAL AND GROWTH OF FULTON CHANNEL SOCKEYE SALMON FRY (ONCORHYNCHUS NERKA),
Fisheries Research Board of Canada, Nanaimo (British Columbia). Biological Station.
H. T. Bilton, and G. L. Robins.
J Fish Res Board Can. Vol 30, No 1, p 1-5. 1973. Illus.
Identifiers: *Canada(Fulton River), Channels, Feeding, Fry, Growth stages, Oncorhynchus-nerka, *Sockeye salmon, Survival, Fish mortality, *Salmon starvation.

In the laboratory 8 groups of Fulton River (Canada) channel fry were starved for periods ranging from 1 to 7 wk, then offered food ad libitum for 8 wk. Fry withstood up to 4-wk starvation with less than 10% mortality; beyond this point mortality increased sharply to 90% at 7-wk starvation. At 5-wk starvation both fry length and weight decreased significantly. Mortality continued when fish were offered food ad libitum after being starved. Among fish starved for 1 and 2 wk, mortalities continued to be low, 0 and 6.6%, respectively; but among fish starved from 3 to 5 wk, mortalities rose considerably, ranging from 42-99%.--Copyright 1973, Biological Abstracts, Inc.
W74-06119

EFFECT OF ILLUMINATION AND WATER TEMPERATURE ON CRITICAL FLOW RATES FOR FISH, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Evolutionary Morphology and Animal Ecology.
For primary bibliographic entry see Field 2I.
W74-06250

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

SUPPORT IN THE OVERALL DESIGN DEVELOPMENT OF A NATIONAL WATER DATA EXCHANGE (NAWDEX), EXECUTIVE SUMMARY,
PRC Systems Sciences Co., McLean, Va.
For primary bibliographic entry see Field 7C.
W74-06350

ENVIRONMENTAL INFORMATION SYSTEMS DIRECTORY--AN INVENTORY OF ADMINISTRATIVE AND ENVIRONMENTAL MISSION SUPPORT SYSTEMS WITH INDEXES.
Environmental Protection Agency, Washington, D.C. Office of Planning and Management.
For primary bibliographic entry see Field 05G.
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10F. Preparation Of Reviews

POLLUTION OF THE NORTH SEA,
Deutsches Hydrographisches Institut, Hamburg (West Germany).
For primary bibliographic entry see Field 05B.
W74-06023

2, 4, 5-T,
Phytox Corp., College Station, Tex.
For primary bibliographic entry see Field 05C.
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Surface Observations, Ground Truth and Data, NASA-USGS Mission 144, Chesapeake Bay Region, Sept. 22-30, 1970,
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- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

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